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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. SEPTEMBER 7, 1899. CHICAGO, ILL. NUMBER 36

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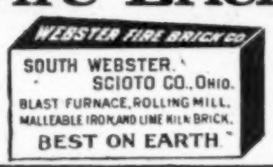

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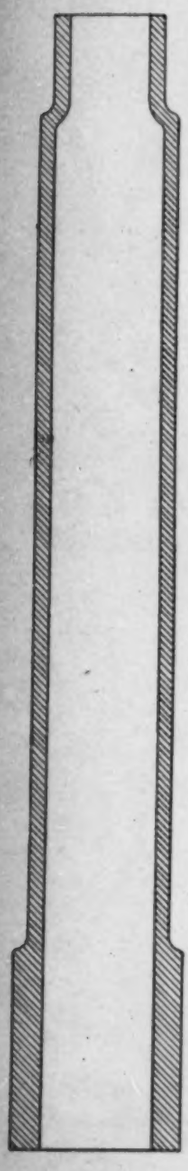

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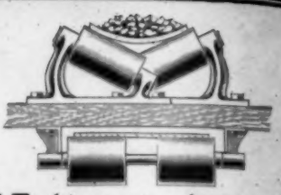

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. SEPTEMBER 7, 1899. CHICAGO, ILL. NUMBER 36

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

It has been a week of large buying in foundry and gray forge irons, and on both prices have advanced, the conditions in Southern iron indicating excitement and tension. On non-Bessemer irons there seems no peradventure concerning 1900; most buyers and sellers apparently acting on the belief that prices will go yet higher and that consumption for some time to come will keep in advance of production. In the steel end of the trade the development of the situation as it looks toward next year has not been so rapid. What appears is that demand is not gauged by price, and that steel works and finishing mills are full for months and are booking new business every week. Large producers are searchingly analyzing the record of each week, but the scrutiny has made no change in the tenor of their reports. There is a monotonous testimony to a rising tide whose high point does not appear. An event of the past 24 hours illustrates what has been referred to frequently in this report —the far-reaching possibilities of even a slight break in the chain that begins at iron mines and ends at the cooling beds of the mills. An ore carrier sunk in the narrow channel of the St. Mary's river has stopped the ore procession out of Lake Superior, and the interruption may be long enough to produce a visible curtailment in the supply of steel in the Central West before next May. But up to Sept. 1 the Lake Superior ore movement has been more than 10½ million tons, or 1,400,000 tons above the record to the same date last year, and more than the total season's ore movement in the boom year 1895. But high freights, interrupted traffic and nearly exhausted stockpiles promise to make a sharp reduction from this time on. The advances in pig iron referred to above have amounted to nearly $1 a ton in the week on Southern and Eastern iron, with a further advance pending. The two leading consumers of gray forge in the Pittsburg and valley districts have been in the market, taking fully 40,000 tons and sending the price up sharply. The Bessemer pig iron basis for 1900 is exected to be fixed shortly. A meeting of producers this week will have before it inquiries from important steel makers and sales will no doubt result. It is probable that the figure will not be below $22 and some furnacemen's ideas are above this. Structural steel producers have done considerable business on the new basis, but naturally there will be somewhat reduced consumption toward the end of the year, and with cooler weather production in this and other lines will increase. There has been considerable quiet figuring on rails for next year, particularly by Eastern roads, and some sales are rumored, though prices are not given. Sheets are from $3 to $5 a ton higher. Wire products have advanced $3 a ton, except painted barb wire, which is up $10 a ton. Steel bars have advanced and leading Pittsburg producers have 2.50c as minimum, with higher figures asked for open-hearth stock.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Sept. 6.

The local iron and steel market has been devoid of important incident in the past week. A period of comparative quiet is necessary before selling operations can be resumed on the proper scale. Producers must catch up at least a little with their obligations before they have any basis on which to promise deliveries on future sales, while buyers would like to sound their position a little while in this condition before buying heavily for the next season. Interest centers mainly on the course of the market during next year, but in view of the surprises of this year one should really not make any attempt to look so far ahead. There is plenty of time to let matters come more to a head in regard to the prospects for next year's business. Some light may be thrown on the matter by the meeting of the Bessemer Furnace Association, to be held the latter part of this week to act upon some inquiries they have for Bessemer for next year's delivery. There is reason to believe that at this meeting a price will be fixed at which a limited tonnage at least will be sold for next year's delivery, and this will be some indication as to the probable course of the general iron and steel market. So far the material sold for next year's delivery in all lines has been more or less of a gamble, purchases having been held to be safe merely because it was impossible to figure out how any slump could occur.

Interest grows in the question of how much consumption will be affected by high prices. Bearing in mind the fact that the bulk of purchases this year have been at prices much below the present level, it cannot be denied a whole season's purchases at present prices would be a totally different proposition. The fact has been dwelt upon that the present high prices have not shut off the demand which has latterly been forcing prices still higher; but it should be remembered that this demand has been for comparatively small quantities only, and that much of it may represent losses to buyers who are forced to buy in order to fill obligations which they are sorry they shouldered. The high prices have been on only a small part of the production. Over and above the facts which have been recited, it must be borne in mind that next year is a Presidential year, and however certain it may be held the result of the election already is, there is a sentiment connected with Presidential years which has exerted a powerful influence ever since there were Presidential elections. Producers generally are taking a wise course in making no effort to press business, but rather holding it off by quoting high prices. The wisdom of such action may be better appreciated next year.

Price changes during the week have been of small moment. In pig iron and billets there has been a slight marking up of values, but only a very small turnover. Producers have made some little progress in catching up, but they still are a long way off, and in Bessemer pig iron and steel they will not be caught up until early next year.

PIG IRON.—There has been nothing of importance in the Bessemer pig iron market during the week. Two or three thousand tons of Bessemer have changed hands for delivery next year, at prices averaging $22, valley. The valley furnacemen will meet the latter part of this week and will in all probability fix a price for Bessemer at which some iron will be sold for next year. They have several inquiries to come before the meeting, which it is claimed was not the case at the last meeting. The price to-day of Bessemer for the first half of next year is all of $23, Pittsburg, while if any one had a few thousand tons, the delivery of which he could guarantee in the next two months or so, two or three dollars a ton more than this could probably be secured for it. In forge iron there is considerable scarcity, with a decided difference of opinion as to prices, for both present and future delivery. The market is between 50 cents and $1 above that quoted last week, and in the valleys iron is particularly scarce, so that not far from Pittsburg prices are being paid. In foundry iron prices cover a rather wide range, especially for near-by delivery, while for delivery next year there are some efforts being made to create the impression that a decided premium over this year's delivery should be paid. Yet foundry iron at $20 for No. 2 for the first half or the whole of next year is a good figure, and is by no means too low as compared with Bessemer, when the scarcity of Bessemer is considered, together with the comparative costs of material for the two. Those who hold that foundry iron for early guaranteed delivery should command a premium over next year's delivery seem to have the best of the argument. We quote prices as follows for deliveries beyond December, except in the case of gray forge:

Bessemer, valley furnace	$22.50 to $22 50
Bessemer, Pittsburg	23.00 to 23.25
No. 1 Foundry	20.50 to 21.05
No. 2 Foundry	20.00 to 20.50
No. 3 Foundry	19.50 to 20.00
Gray Forge, valley furnace	19 25 to 19.75
Gray Forge, Pittsburg	19.50 to 20.00

STEEL.—The steel mills have done rather better last week than for some time, and a little progress was made toward catching up with specifications. There is very little doing for next year, while for delivery in the next few months only small transactions have been possible. There is considerable diversity of opinion as to the value of steel to be delivered in the next two months, and sales have been on such a small scale that no fixed market price has been made. Quotations are made all the way from $38 to $45 for 4x4 billets, although it is admitted that for slabs the lower of these figures could not be done in any case. It is claimed that offers of $43 for billets have been freely made for delivery any time this year. Nothing less than $50 can be done for open-hearth billets.

FERRO-MANGANESE.—This line continues scarce and $100 is the lowest quotation made.

RAILS AND TRACK MATERIAL.—The rail market is rather quiet. There has been some quiet negotiation for next year by some of the railroads, but no open business has been transacted, and it is somewhat of a question what the rail price really is, although nominally $30 to $32 is quoted, depending on the tonnage, for standard sections. In track material there is a fair demand, at prices unchanged as follows: Spikes, 2.50c to 2.60c; track bolts, square heads, 3.10c; hexagon heads, 3.25c; splice bars, 1.75c to 1.90c; links and pins, 2.60c to 2.65c.

BARS.—Prices for bars are very strong. Steel bars cannot be had under 2.25c, and as high as 2.50c is quoted, half extras, while all muck iron bars are quoted from 2.15c to 2.25c.

STRUCTURAL MATERIAL.—Prices remain as last quoted. While another advance has been predicted, this is hardly likely to be made as it is understood that prices are now just under the importing point, and there is no question that investors will not be over-anxious to engage in new ventures requiring large quantities of structural material at present prices or anything like them. We repeat quotations as follows: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees, 2.30c; zees, 2.25c; angles, 2.25c. Universal mill plates remain at 2.60c to 2.75c.

PLATES.—The plate market continues in good shape, without noteworthy change. Prices are about as last given, but mills are of course catching up now, as they have been selling quite sparingly for some time, while turning out an enormous tonnage at the same time. We quote as follows for delivery in the next three or four months: Tank, 2.65c to 2.70c; shell, 2.75c to 2.80c; flange, 2.85c to 2.90c; fire box, 3½c to 4c.

PIPES AND TUBES.—The full scheme of selling agencies, etc., of the National Tube Co., just formulated, is given at length on another page. The demand keeps up well. The new management is making a redistribution of orders among the mills, by which mills overcrowded with orders for certain sizes are relieved by transferring certain orders to other mills which can handle them to better advantage. By this means the company is bringing all sizes to the same level, so that it will be able to book orders for any ordinary sizes for delivery within say two months, and place them with any of a number of mills. Discounts have not been changed, and are as follows: Merchant pipe, base discount, 50 per cent and additional discounts of two 10's for less than carloads and two 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; lap weld casing, 40 for screw and socket joint and 35 for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½ inch, 40 per cent; 1¾ to 2½ inch, 50 for iron and 55 for steel; 2¾ to 6-inch, 55 for iron and 57½ for steel; extra 5 per cent to dealers.

SHEETS.—Judge W. H. Moore, the promoter of the sheet combination, is expected back from a long vacation this week, and will proceed at once to take up the consolidation of the sheet mills, active work on which was dropped a couple of months ago. The matter will be pushed rapidly to a consummation, and by the end of October it is probable that all the preliminaries will be completely arranged, so that on Nov. 1 the sheet mills will begin to be operated on account of the new company, although the formal organization may not be completed by that time. The promoters have as yet given no inkling as to the probable capitalization of the company, and it is not certain just how comprehensive the organization will be, although it is regarded as settled that all the good companies will be included. The market has further strengthened during the past week, and it would be difficult to do 3 25c for No. 28, many producers quoting 3.35c, and even higher. On the basis of 3.35c No. 27 is quoted 3.25c; 25 and 26, 3.15c; 22, 23 and 24, 3.05c, while 14 gauge is quoted only a trifle lower, or about 2.75c. The market for galvanized is unchanged at 70 and 5 per cent off, with a 15-cent freight allowance.

SPELTER.—The spelter market has regained some of its strength since the slump early last week, and is now quoted at 5.65c to 5.75c, Pittsburg, for prime Western grades.

OLD MATERIAL.—The market for old material continues irregular and rather active considering the scarcity. We quote prices nominally as follows Pittsburg, gross tons, except where otherwise specified: Heavy melting stock, $17 to $18; steel rails, mixed lengths, $18; iron rails, $22 to $22.50; cast borings, $9, net tons; cast scrap, $16 to $17; No. 1 wrought scrap, $17, net tons; busheling scrap, $13 to $14, net tons.

COKE.—The coke market continues very firm, spot coke still commanding a premium. On new contracts strictly Connellsville furnace coke is held at $2.50, while foundry grades are quoted at $2.75 to $3.

CHICAGO.

Office of The Iron Trade Review and Industrial World.
1522 MONADNOCK BLOCK, Sept. 5.

There seems to be almost no limit to the demand for iron and steel, and it is only because mills and furnaces cannot deliver material as fast as consumers would like that sales are not a great deal larger than they are. As it is, considerable quantities are placed every week for delivery next year, and advancing quotations do not seem to check buying at all. Purchasers pay what is asked, their only anxiety being, apparently, to secure the material. Even with prices at the present high level, predictions are freely made that the top has not been reached, but that values will be much higher within a few weeks. Some buyers hold to the belief that iron and steel will not be worth anything like present values by the middle of next year, but these are the excep-

tion, and the general impression is that high prices have come to stay for a much longer time.

PIG IRON.—A prominent official of one of the leading Southern pig iron producers is reported as saying that he feels like stopping sales, as it looks to him "as though iron were bound not only to go higher, but very much higher." Local sales agents are cautioned to go slow in taking business, and to accept only small orders without consulting with the home offices. The leading Southern producer is sold up almost entirely on all grades until March 1, and on most grades until July 1 of next year. Prices are $1 a ton higher on Southern irons than last week, and another advance of 50 cents is expected before the end of the present week. The demand is heavy for next year's delivery, and sales in the week aggregated a large tonnage. This is true of both Southern and Northern irons, although the former closed the larger business of the week. Most foundries seem to be fairly well supplied with iron for the balance of this year, which is fortunate, as it would be almost impossible to get any for delivery before the first of the year. In many cases, however, foundries have been compelled to stop work for a short time because of the lack of material. Quotations are revised as follows, but it should be stated that they are subject to change at any time without notice:

Lake Sup. Charcoal	$24 00 @ $26 00	Southern Coke No. 3	$19 90 @ $20 40
Local Coke Fdy. No. 1	20 50 @ 21 00	Southern No. 1 Soft	21 50 @ 22 40
Local Coke Fdy. No. 2	20 00 @ 20 50	Southern No. 2 Soft	20 90 @ 21 40
Local Coke Fdy. No. 3	19 50 @ 20 00	Southern Silveries	24 15 @ 24 65
Local Scotch Fdy. No. 1	20 50 @ 21 00	Jackson Co. Silveries	28 80 @ 29 80
Local Scotch Fdy. No. 2	20 00 @ 20 50	Ohio Strong Softeners	23 00 @ 24 00
Local Scotch Fdy. No. 3	19 50 @ 20 00	Alabama Car Wheel	24 00 @ 25 00
Southern Coke No. 1	21 90 @ 22 40	Malleable Bessemer	22 50 @ 23 00
Southern Coke No. 2	20 90 @ 21 40	Coke Bessemer	23 50 @ 24 00

BARS.—The demand continues good, and considerable sales of both iron and steel bars were made last week, with large inquiries still unsatisfied. Western mills secure the larger share of the business, as their prices are considerably under those of Eastern mills. Mills do not appear to be pushing business at all, but are simply taking what orders are forced upon them. Quotations are made at 2.15c to 2.25c for common iron, with advances on less than carload lots. Local mills ask 2.20c to 2 30c, half extras for size and cutting to length, for soft steel bars, while Eastern mills want from 10c to 20c a hundred more.

CAR MATERIAL.—The only large order placed last week was for the steel for 1,000 cars placed by the Pennsylvania with the Terre Haute Car Works. Other business included material for 300 cars placed with the Pullman. The demand is heavy, and gives indications of large orders for cars for the future.

STRUCTURAL MATERIAL.—The largest order of the week was for 1,000 tons of steel placed by a bridge works. Business would be much heavier could the mills handle the tonnage offered. One of the Western trunk lines has been endeavoring to place a contract for a number of bridges, but has not been able to secure the steel required. The market is exceedingly strong at the advanced quotations. Prices are as follows: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches, and over six inches, 2.50c; three inches to six inches, 2.40c; sheared plates, 3.25c to 3.35c; universal plates, 3.15c to 3.25c; tees, 2.40c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

PLATES.—The local mills took several orders for plates last week, from some of their regular customers. Sales would have been very much larger had the mills been able to take all the offered business. The demand continues very heavy, but in most cases is unsatisfied. Prices are made as follows: Tank steel from store, 3.35c to 3.40c. Mill shipments, Chicago delivery: Tank steel, 3.25c; shell, 3.35c; flange, 3.40c; marine, 3.40c; fire box, 4c to 6c according to brand.

MERCHANT PIPE.—The demand continues very heavy, being much beyond the capacity of the mills and local storehouses to supply. Prices are steady at 50 and 10 to 50 per cent off.

SHEETS.—There was a slightly better demand for both black and galvanized sheets, and sales in the week were larger than those of the week previous. No. 27 black sheets are quoted at 3.25c to 3.40c, Chicago, mill shipment, and galvanized at 70 and 5 per cent off, mill shipment, and 70 off from store.

MERCHANT STEEL.—Business last week was light, as there are very few season's contracts to be placed. General business has fallen off to a considerable extent, also. Mills are having all they can do to keep up with orders already placed, and welcome a lighter demand. Smooth finish tire steel is quoted 2.60c to 2.70c; smooth finish machinery steel, 2.90c to 3.05c; spring steel, 3.20c to 3.30c; tool steel, 6.50c to 7.50c; special, 13.50c and upwards.

BILLETS AND RODS.—There were no sales reported last week, and prices remain nominally as last quoted. Bessemer billets are worth about $35 for future deliveries, open-hearth $40 or more, and rods about $45.

RAILS AND TRACK SUPPLIES.—There is a considerable demand for light rails, and several good orders were placed last week with the local mills. No business was done last week in standard sections. Quotations are as follows: Rails, standard sections, $31 and higher; light sections, $31 to $37; splice bars, 1.80c to 2.50c; spikes, 2.40c to 2.50c; track bolts, 2.90c to 3.25c.

OLD MATERIAL.—There is a large demand for all classes of old material, but sales are not heavy, as the supply is limited, and such small lots as make their appearance on the market are snapped up at once. Quotations are unreliable, as the market fluctuates not only from day today but from office to office.

Old iron rails, gross	$22 00 @ $22 50	Axles, net	$19 00 @ $20 00
Old steel rails, long, gr.	16 00 @ 16 50	Cast borings, net	7 00 @ 7 25
Old steel rails, mixed	15 00 @ 15 50	Wrought turnings, net	7 50 @ 8 00
Old wheels, gross	15 50 @ 16 00	Axle turnings, net	8 50 @ 9 00
Railroad forge, net	16 00 @ 16 50	Mixed steel, gross	12 00 @ 12 50
Dealer's forge, net	12 50 @ 13 00	Stove plates, net	7 50 @ 8 00
No. 1 mill, net	9 00 @ 9 25	Heavy melting steel, gr	14 00 @ 14 50
Heavy cast, net	13 00 @ 13 50	Old iron splice b., net	16 50 @ 17 50
Malleable cast, net	10 00 @ 11 00		

WIRE AND WIRE NAILS.—Sales last week were much increased, as the demand appears to be getting heavier every day. Local sales agents report buyers very anxious to place their orders as early as possible. Advances were made in quotations with the first of the month, painted barb wire being advanced 50 cents, while other grades of wire and wire nails were advanced 15 cents a hundred. Makers quote single car loads of wire nails at $2.95 f. o. b. Chicago, and $3.05 less than car loads. On wire current quotations are as follows: Plain annealed wire, $2.80; painted barb wire, $3.40; galvanized barb wire, $3.55.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Sept. 6.

The ore movement for August was tremendous, exceeding even the unprecedented July record of 2,896,715 tons. Complete returns from all upper lake docks but two and a close estimate of the latter give a total for August of 2,925,000 tons. This added to the record-breaking total of 7,639,706 tons to Aug. 1 gives total shipments to Sept. 1 of 10,564,000 tons—or nearly 1,000,000 tons more than the shipments for the entire season of 1896, and more than the total for the boom year 1895. To Sept. 1, last year, the total was 9,142,149 tons, or more than 1,400,000 tons below this year's record. But August is no criterion for September, the latter being the month in which, as well informed ore men have predicted, a decided falling off in stockpile shipments will appear. Now another reason for curtailment appears in the high freights which have become a serious bar. In some cases it has been found that important mines could exceed by a small percentage the output fixed upon in the early part of the season. High freights will stop the bringing down of such ore. In a few cases ore was sold in the past two months with the stipulation that any freight above a certain maxiumum is to be charged to the buyer; but the aggregate of such ore is not large. In the week the Duluth rate has gone to $1.85, and $2 is now asked. Marquette business has been done in the past two days at $1.50 and the Escanaba rate is nominally $1.20. News of the sinking of the steamer Douglass Houghton of the Bessemer fleet in the St. Mary's River on Tuesday, has just introduced an element of serious import to the ore trade. Estimates of the time required to open the channel vary from several days to three weeks. Figuring that the ore boats now in Lake Superior lose one trip by the accident, the curtailment will mean no inconsiderable amount. Gogebic and Marquette mines can ship to Escanaba, to be sure, but railroad and dock facilities there are presumably not elastic enough to take care of any large inrush of business in addition to the normal amount. Meantime boats at lower lake ports will be sent generally to Lake Michigan, which temp-

orarily will give an easier Escanaba rate. Interest is felt by ore men in the projected Virginia & Ely Railroad of the Carnegie-Oliver company, referred to elsewhere, which will afford a second outlet from the Vermillion range and a fourth from the Mesabi range. Its effect on the Minnesota ore rate is the question of greatest import.

PIG IRON.—A demand for an advance of 10 cents a day was made at a Mahoning valley furnace in the latter part of last week, and was granted, other furnaces following. This puts labor in the Mahoning valley at $1.45 and turn work at $1 90. The Shenango valley furnaces have announced a 10-cent advance also in the last two days, making labor at Sharpsville $1.50 and turn work $1.90. No transactions in Bessemer iron are reported by the associated furnaces for the week, but a large Pittsburg interest has been feeling the market recently, and the establishment of a basis for a considerable tonnage for delivery in the first half of 1900 may come soon. At the recent meeting of the furnacemen it is understood that ideas of price ranged from $20 to $25. It is evident that the basis for billets for next year will be higher than it has been put in the thinking of some in the trade. The trade in foundry iron is still active, with advancing prices. Some furnaces represented in Cleveland have stopped selling for the time being, having taken so many contracts for delivery next year that it is deemed prudent to get the lay of the situation for a little and make sure that deliveries can be met as they come due. The price has advanced 50c to $1 a ton in the past two weeks, and we quote No. 2 foundry at $20.50 to $21.50 valley furnace. Forge iron is very firm at $19.25 to $19.50 in the valley. Large purchases of Southern forge have been made by Pittsburg and valley interests in the past week, and $14.25 and $14.50 Birmingham has been done. We quote the Cleveland market:

Bessemer	$21 75@$22 75	Valley Scotch No. 1	$21 75@22 75
No. 1 Strong Foundry	21 25@ 21 75	Valley Scotch No. 2	21 25@21 75
No. 2 Strong Foundry	20 75@ 21 25	Gray Forge, valley	19 25@19 75
No. 3 Foundry	19 25@ 19 75	Lake Superior Charcoal	24 00@25 00

FINISHED MATERIAL.—There appears not the slightest let-up in the demand for prompt material and buying for next year is a regular feature. It is to be expected that the call for structural steel will be somewhat lessened as the end of the year approaches, but the $5 advance of last week has by no means stopped buying. Bars are firmer, and 2 50c Pittsburg for Bessemer is more commonly quoted, with higher prices asked for open hearth. Bar iron is 2c at valley mill, half extras, with $1 a ton extra for cutting, $2 for assorted sizes—virtually a 2.15c rate on ordinary business. On less than carload lots full extras are charged. The demand is very strong and the leading producer is making sales into next year. The sheet market is stronger and advances of from $3 to $5 a ton are indicated by fresh quotations made in the past week, putting No. 10 black sheets at 2.75c Pittsburg mill; from No. 14 to No. 21 at 2.95c; No. 27 at 3.25c; and No. 28 at 3.35c. The demand for sheets out of stock keeps up well. For galvanized there is now a less urgent demand, and the recent decline in spelter has made an easier market. We quote 70 and 5 at mill with 15 cents freight allowance. The plate market is very quiet. For 1859 delivery 3c is generally asked, and some Western business is going to Eastern mills.

WIRE AND WIRE NAILS.—The heavy demand for wire and nails and the advances in primary materials have led to a revision of prices. Wire nails are now $2.65, Pittsburg mill, in carload lots to jobbers and $2.80 in carload lots to retailers—or 15 cents higher than last week. Smooth wire is now quoted $2 50 Pittsburg in carload lots to the jobbing trade. Painted barb wire has advanced 50c, being now $3.10 Pittsburg to jobbers; galvanized is $3.25.

OLD MATERIAL.—There is still an advancing tendency, prices being particularly strong on steel melting stock. We quote old steel rails at $17; cut to length, $18; old car wheels, $18; old iron rails, $22 to $23—all gross tons. No. 1 railroad wrought scrap is higher at $17.50 to $18; mill scrap, $13.50; iron axles, $22.50 to $23; axle turnings, $12; machinery cast scrap, $14.50 to $15; grate bars, $8; wrought turnings, $10 to $10.50; pipes and flues, $12.50; cast borings, $9 to $9.50.

CINCINNATI.

Sept. 5.

The tendency is still toward a higher range of values on pig iron. Some large orders have been booked in the past week and both Southern and Northern irons have advanced. There is no concerted action among producers. Furnaces are oversold for this year and consumption still increases. Rogers, Brown & Co. say: "The demand has been unexpectedly heavy for pig iron during the past week, for it was thought that the recent advances would somewhat check inquiry. It seemed certain that some of the large companies would be obliged to purchase round lots of low grades for delivery during the remainder of this year, but sellers have been surprised at the continued rush of inquiries and orders from all classes of the trade. A number of round lots have been sold at full prices and many small sales have been made at what appeared to be fancy figures. The market is irregular at the close of the week, ranging about 50 cents per ton higher than at the beginning. $16.25 cash Birmingham for No. 2 foundry seems to be a fair quotation, with other grades in proportion. It is impossible to give exact prices, for each producer is a law unto himself. In Northern coke irons an advance of about $1 per ton has been made and will probably be maintained. There has been a fair movement of charcoal iron and at present prices the Southern brands of charcoal are really the cheapest thing on the market." We quote as follows f. o. b. Cincinnati: Southern coke, No. 1 foundry, 20.25 to $20.50; No. 2, foundry, $19.25 to $19 50; No. 3, foundry $18.50 to $18.75; No. 4 and gray forge, $18 to $18.25; No. 1 soft, $20 25 to $20.50; No. 2, soft, $19.25 to $19.50; Lake Superior coke, No. 1, $21.50 to $22.50; Lake Superior coke, No. 2, $21 to $21.50; Hanging Rock charcoal, No. 1, $22 to $23, Jackson Co. silvery, No. 1, $28; standard Georgia car wheel, $19 75 to $20.25; Lake Superior charcoal, $25.

Matthew Addy & Co. make this comment on a very active week: "It is the same old story of continued strength and advancing prices. During the week Southern gray forge jumped from $14.25 to $14.75 f. o. b. Birmingham. At Hanging Rock No. 2 foundry went from $19.50 to $21; and these long upward strides did not check the buying. The market to day looks stronger and more promising than at any time since the upward movement began. Apparently there is no reason to believe that this movement has reached its maximum or in any way spent its force. The week was marked by large purchasing of gray forge, sales to the extent of more than 40,000 tons having been made in Pittsburg and the valleys. In addition there was considerable purchasing of foundry irons. There is a demand now for soft irons which it is impossible to supply."

PHILADELPHIA.

Sept. 5.

The market has continued active the past week, with prices advancing. Two revisions a week are really needed to keep in line with transactions as they come up. The basis for pig iron is now easily 50 cents above that of a week ago and there is no indication of shrinkage in the demand. In the past few weeks iron has been bought in this market for shipment to points farther West—Pittsburg and Chicago—and some sales have been made for New England consumption. This increased competition for Eastern Pennsylvania iron is having its natural result. It is an index also of the steady increase of demand and the continued inadequacy of supply. No. 2X foundry is sold at $22 Philadelphia. This is minimum for near-by deliveries, and it is questionable if any could be had now below that basis of shipment next year. Some sellers quote $22.50 for 1899 delivery. Basic iron has sold at $23, or nearly the basis for No. 1X foundry; low phosphorus at $26 to $27. The freedom with which contracts for next year are made at prices advancing week by week is giving practical answer to the sentiment of some who aver that the present prices will not hold through the first half of next year. The amount of added furnace capacity in line by Jan. 1, will give a better index than is now obtainable; but it is to be considered that consumption for 1899, as indicated by the recurring purchases by foundries supposedly covered for this year, is constantly proving that it is beyond all reckoning. Steel billets are still nominally set at $40, but for any delivery before Nov. 1 $45 would have to be paid and at that little material can be found. We quote muck bar nominal at $33.50 to $34. In finished material, mills report that orders continue to flow in at full prices. A lot of 1,200 tons of bars has been sold here for

shipment to Chicago. Plates have been sold also for shipment westward, the Pittsburg, Cleveland and Chicago mills being unable to take business offered. Premiums of several dollars a ton are offered for guaranteed deliveries, and on bars and plates the average is $2 to $3 above last week. We quote refined bar iron at 2.05c to 2.15c; tank plates, 2.80c to 2.90c; angles, 2.38c to 2.50c; beams and channels, 2.43c up to 15 inches, and to 2.65c for wider; sheets No. 1, 10 to 14, 2.90c to 3c; No. 27, 3.40c. The old material market is a trifle easier on steel which was the feature last week. Urgent buyers are now supplied. We quote old steel rails, $18 to $19; steel axles, $17.50 to $18; iron axles, $25 to $26; choice railroad scrap, $20 to $21; No. 1 yard scrap, $15 to $16; machinery cast scrap, $14.75 to $15.25; wrought turnings, $13 to $13.50; old iron rails, $22 to $22.50. Holders in all lines are quite firm.

Ohio-Kentucky Fire Brick Consolidation.

For some time the consolidation of fire-brick companies in the Ironton and Portsmouth, O., and Ashland, Ky., districts has been mooted. It is now stated that a $6,000,000 company will be incorporated soon to take in 13 plants. The combined capacity of these plants is 400,000 fire brick a day. The total acreage of clay lands controlled is 14,000. At least $2,000,000 in cash will be required to purchase the plants already optioned. This will place the capital stock at not less than $6,000,000. The Guaranty Development Co., of New York, will probably finance the deal. The companies included are as follows: Aetna Fire Brick Co., Oakland, O.; Scioto Fire Brick Co., Scioto, O.; Webster Fire Brick Co., South Webster, O.; Ashland Fire Brick Co., Ashland, Ky.; Kentucky Fire Brick Works, Fire Brick, Ky.; Scioto Star Fire Brick Works, Portsmouth, O.; Clinton Fire Brick Works, Ashland, Ky.; Portsmouth Fire Brick Co., Portsmouth, O.; Ironton Fire Brick Co., Ironton, O.; Parker & Austen Fire Brick Co., Ironton, O.; Petersburg Fire Brick & Tile Co., Coal Grove, O.; Olive Hill Fire Brick Co., Olive Hill, Ky.; Oak Hill Fire Brick Co., Oak Hill, O.

Personal.

H. C. Frick, chairman of the Carnegie Steel Co., Ltd., returned from Europe this week.

M. B. Wittman, for 12 years with the E. & G. Brooke Iron Co., Birdsboro, Pa., latterly as manager of blast furnaces, has accepted the presidency of the Danville (Pa.) Bessemer Steel Co., assuming his duties on Sept. 1.

Harry L. Schotter, who resigned as superintendent of the universal mill of the Pottstown Iron Co., Pottstown, Pa., was given a silver water service by the employes. He has gone to Homestead, Pa., to become superintendent of the Carnegie Steel Co's 48 inch universal mill.

Harry Konitzky, superintendent of the Columbian Iron Works, Baltimore, Md., goes to Philadelphia to assume the management of the Charles Hillman Ship & Engine Building Works. The works, which have been closed since last December, have just been purchased by a syndicate.

Charles L. Bailey, president of the Central Iron & Steel Co., and of Chas. L. Bailey & Co., Inc., proprietors of the Chesapeake Nail Works, Harrisburg, Pa., is reported to be seriously ill and it is feared he cannot recover.

W. E. Reis, president of the National Steel Co., has been elected a member of the executive committee of the American Steel Hoop Co. The following statement is made concerning the business of the American Steel Hoop Co.: In July there were shipped 63,000 tons of product, of which 20,000 tons were pig iron and 43,000 tons finished iron and steel. Output is expected soon to reach 70,000 tons monthly. Aug. 1 the company had booked orders for 20,000 tons of finished product and 75,000 tons of pig iron. On raw material for mills the company is covered to March 1. For blast furnaces ore is contracted for running to July 1, 1900. Its own collieries and coke ovens produce enough to meet half its requirements. From April 17 to Aug. 1 net earnings are estimated at $600,000, mostly on low-priced business under old contracts. A profit of $10 a ton is estimated on orders now on hand.

THE NATIONAL TUBE COMPANY.

The general organization of the National Tube Co. was completed some time ago. Horace Crosby, second vice-president, has just completed organizing the selling department of the business, the plan of which is given below. This will be of particular interest to buyers of pipes and tubes, as they can see from their location with what point it is necessary for them to correspond in order to secure prices or place orders. The sales agent in each district is to have full charge of his district, and purchasers can be more promptly served by confining their correspondence to the sales agent of the district. The general offices of the National Tube Co. have been established in the Coestoga Bldg., Pittsburg. The officers are as follows: *Edmund C. Converse, president; Joshua Rhodes, chairman of the board; F. J. Hearne, first vice-president; Horace Crosby, second vice-president; *Francis L. Potts, third vice-president; A. S. Matheson, general manager; *A. F. Luke, treasurer; William H. Latshaw, assistant treasurer; *Sullivan & Cromwell, general counsel. The officers whose names are marked with an asterisk have their headquarters in New York City; the others are located in the Pittsburg offices. The directors of the company are Joshua Rhodes, J. J. Vandergrift, Charles H. Coster, Wm. B. Rhodes, F. J. Hearne, J. N. Vance, John Eaton, Francis Potts, F. R. Tobey, Jonathan Rowland, Daniel O'Day, O. C. Barber, Henry Aird, John Don, Edmund C. Converse, Wm. Nelson Cromwell, Wm. S. Eaton, A. F. Luke, Wm. J. Curtis, Horace Crosby, A. S. Matheson, Wm. P. Hamilton, and A. H. Gillard.

Mr. Horace Crosby, second vice-president, in charge of the mercantile affairs of the company, announces the following organization of sales officials and plan of handling orders:

Edward Worcester, general sales agent, Conestoga Bldg., Pittsburg.

Geo. S. Garritt, assistant general sales agent, Conestoga Bldg., Pittsburg.

The United States has been districted as follows. Announcement concerning Southwest territory will be made later:

NEW YORK TERRITORY.

Headquarters: Havemeyer Bldg., New York City.

Sales agent, Clifton Wharton, Jr.

Territory: All of New England, New York, New Jersey, California, Nevada, and that part of Pennsylvania directly west of Altoona but excluding the city of Philadelphia.

Boston and New York territory have been consolidated, but a Boston office will be maintained at 70 Federal st., in charge of P. W. French and C. F. Velasco, sales agents.

PHILADELPHIA TERRITORY.

Headquarters: 267 South Fourth st., Philadelphia.

Sales agent: H. Cheston Vansant.

Territory: The city of Philadelphia, Delaware, Maryland, east of Cumberland, but not including Cumberland, Virginia, North and South Carolina, Georgia, Florida, and Alabama.

PITTSBURG TERRITORY.

Headquarters: Fidelity Bldg., Pittsburg.

Sales agent: A. M. Lally.

Territory: Pennsylvania west of Altoona but not including Altoona, Maryland—Cumberland and west thereof, West Virginia, Ohio, Kentucky, Indiana and Michigan.

CHICAGO TERRITORY.

Headquarters: Clinton and Fulton sts., Chicago.

Sales agent: H. S. Raymond.

Territory: Illinois north of parallel 40 deg.; Wisconsin, Minnesota, Iowa, Nebraska, North and South Dakota, Montana, Wyoming, Colorado, Utah, Idaho, Oregon and Washington.

FOREIGN.

Headquarters: Havemeyer Bldg., New York City.

Territory: All export business.

Important Blast Furnace and Steel Works Contract.

The Wellman-Seaver Engineering Co., of Cleveland, has the contract for the modern blast furnace, steel plant, rolling mill, ore-handling equipment and other important work under way for several months at Newport, South Wales, for the Patent Nut & Bolt Co., Ltd., Birmingham, Eng. The Wellman-Seaver company has let a number of important sub-contracts to well known construction and machinery companies in this country.

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AND
INDUSTRIAL WORLD.

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HIGH PRICES AND CURTAILED DEMAND.

We have referred to the plans for lake vessel building that have been laid aside recently because of the high prices of material. Ore-carrying vessels, of 6,000 gross tons capacity and over, that could have built last year for $210,000 would cost $300,000 to-day. The difference seems like a large amount upon which to earn interest in unremunerative seasons. Yet on the basis of calculations vessel men are already making for next season it is not difficult to see that the increment of cost could be easily earned in two years, over and above the profit possible to 6,000-ton boats from a low-level freight like 60 cents from the head of the lake. It is not improbable that the Duluth rate of next year will give an additional profit of 40 cents a ton the season through. That at least would be expected if the price of ore goes $1.50 beyond the 1899 basis. Counting 20 trips and 6,000 tons to the cargo, would mean $48,000 profit for the season over and above the profit yielded by season contracts at 60 cents from the head of the lake. Two such seasons would bring the cost of the $300,000 boat down to $204,000, which is certainly a basis from which to figure remunerative earnings in good times and bad. We have made no allowance in the above for increased vessel expenses and higher dock charges; but the estimated freight rate is probably ultra-conservative in view of the lake traffic to be handled next year and the tonnage available for handling it.

The above calculation illustrates how high prices of material are a seeming prohibition to investment calling for iron and steel, and yet should not prove a real barrier when the compensations to the investor, coming from the very conditions that have made iron and steel prices high, are considered. Prosperity does not give large profits to a producer in a given line without increasing also the purchasing power of the consumer. And where the farmer is getting good returns from more than average crops, as is the case to-day, and has put away beside, the surplus of three preceding years of good prices, there is furnished for the iron and steel manufacturers and for manufacturers in every line a substantial foundation for a period of prosperity that does not begin and end in a singe year. This condition has not been sufficiently recognized in the thinking of those who have been watching week by week for the consumption of iron to drop off because of high prices.

Nor will the momentum of the greater purchasing power of the country's wage earners in manufacturing and mining industries be quickly lost. It has been gathering strength month by month. Savings bank deposits in the past two years have reflected the magnificent increase in the total wage of the country. Theoretically, advancing prices mean curtailed consumption; but the theory applies to advances in prices with no accompanying increase in purchasing power. After a period of starveling consumption the country is now compensating for lost time by supplying legitimate needs, and more than that, by expanding its facilities to care for the ordinary demands of a population largely augmented since the last period of prosperity and having nearly a decade's growth of new needs. For nothing is truer than that as the world grows older the list of necessities of the average man is constantly recruited from the old list of his luxuries.

We believe, too, that the influence of the large consolidations in holding up prices and therefore maintaining wages has not been duly allowed for by those who expect a comparatively speedy reaction. Thus far the consolidations in the iron trade have not made any show of their workings under conditions calling for an exercise of their new power. Prices have been fixed by demand largely exceeding supply. That rapid and serious recessions will not be permitted so far as the power of the consolidations can prevent it, is practically certain.

SYSTEMS FOR REMUNERATING LABOR.

Reference has been made in these columns to the action concerning piece work systems of remuneration, taken by the Iron Molders' Union of North America at its Indianapolis convention and by the International Association of Machinists at its Buffalo meeting. The molders declared for the abolition of piece work and this is one of the issues their committee of conference is to raise in its negotiations with the National Founders' Association and the National Stove Founders' Association. The machinists, in their discussion, admitted that though they had been on record as opposed to piece work, their members had been working under various systems of piece-rate pay, and the organization had been put in an equivocal position. It was practically admitted that for good or ill—the latter in the opinion of the majority of the delegates who declared themselves—piece work had come to stay; and the wise thing for the organization to do was to recognize it, while reducing it to the minimum and making the system unpopular with managers.

The signs of the times point to an increasing, rather than a decreasing employment of piece work

systems, and the labor organizations in opposing them are as mistaken as some of them have been in opposing the introduction of machinery. Indeed, the piece price system, with the refinements of its application that are found in many establishments, is as much a triumph of inventive genius as the machines that are so largely responsible for its increasing vogue.

Modern automatic machinery, the increasing subdivision of work and the general tendency to standardize parts have made possible a closer approximation than ever to the relative values of the commoner machine shop operations. The day wage system of remuneration blends manifold and diverse operations into the day-unit. The piece price system analyzes and differentiates and establishes values on a scientific basis. A familiar objection of employes to piece work is that the ambitious workman who has no regard for the good of his less spedy and less efficient brother, is spurred to high records which end in a reduction of the piece price, and a serious curtailment of the remuneration of the average or less than average operative. Another objection, closely related to this, is that large individual outputs under piece work limit the opportunity of employment—simply a different phase of the old argument against labor-saving machinery. In England it has been given practical effect by union regulations restricting a man to a single machine, or by what amounts to a rule, a certain well understood pace of machine operation which every union man sticks to, in spite of all effort to introduce the American way that is to cost the British manufacturer more and more dearly as time goes on.

It has been urged, too, that the piece work system is a method of securing a maximum of labor at a minimum of cost and is the instrument of grasping employers for a steady increase in the amount of toil that must be yielded, to earn a modicum of wages. This is not an argument against the system *per se*, but rather against its administration in unfair hands. The abuse of a thing does not argue that it is not good.

The possibilities of injustice under piece rate remuneration have been recognized by its advocaties, and in the study to increase its efficiency effort has not been wanting to reduce the chances of unfair operation. The differential piece rate system devised by Fred. W. Taylor for the Midvale Steel Works was presented by its originator as one that would remove all cause of contention between works and worker. Mr. Taylor had confidence from his experience with it that it would go far toward solving the labor problem. Another system, known as the premium plan, guarantees a minimum day wage for an average—perhaps less than average—day's work, and a piece rate, less than that which the day wage figures out, on pieces produced above the established day's work.

In the September number of the *Engineering Magazine* P. J. Darlington champions piece work, as against the systems referred to above, and particularly as against the premium plan, which he avers "is founded on false assumptions." Piece pay alone, he argues, is more direct and effective under all conditions, is suited to its purpose, and has failed only when misapplied through ignorance of its principles. We quote from the article this summary of the claims of the three plans:

"Piece work" is piece pay in which the piece price is fixed and independent of the speed of production. "Reduced piece work" is the result of reducing the piece price (on additional pieces only) when the speed of production reaches a change limit.

In the "Taylor differential piece-rate" system, the piece price is at first very low, but when the speed of production has reached a high predetermined change limit, the piece price is raised on all pieces in the contract, provided the workmanship is strictly first class. If, however, the workmanship is inferior but passable, the piece price remains at the very low value. This results in a higher average pay per piece, the faster a worker produces and the better the quality of his product.

The "premium plan" combines two elements: 1. "Liberal" time pay to a low limit of speed of production (full day pay for less than a day's work), with the promise that this low limit shall be set from actual shop results and records. 2. Reduced piece work, or less than proportional piece price on the additional pieces only. In this system the faster a worker produces the lower his average pay per piece.

Piece work pays for the acceptable product only, thus enforcing wage penalty for failure in amount or acceptability. Day work pays for the time that can be spent on the work. The Taylor differential piece-rate system pays for the acceptable product, with a special reward for quick and perfect work, and a special wage penalty for slow production and for inferior, even though acceptable, workmanship. The premium plan pretends to pay in part for the work done, but offers a reward for doing it slowly, and full day pay for doing it not at all or not acceptably.

Otherwise stated if we assume an increase of speed of production, in piece work the worker is given the saving in wages cost, while the employer takes the saving in equipment cost with the additional profits due to increased plant output. In the Taylor differential piece-rate system the employer establishes an additional reward and penalty as extra incentive to increase the output and the quality. In the premium plan the employer demands all the equipment saving, increased profits, and most of the wages saved in addition. Yet the premium plan is presented by its inventor as a profit-sharing scheme.

Particularly well stated is the summation of the distribution of the benefits of increased production as given in the last paragraph of the above. In general the weakness of the premium system is that it throws a sop to the notion persistently propagated and maintained by many organizations that a day's work is a day's work, little matter how resultful, or whether the product is delivered from the workman's hands with a minimum of waste and in a state of maximum perfection. "Piece work" as ordinarily administered makes the matter of speed largely optional with the worker. The differential piece-rate system furnishes the largest stimulus to a high rate of production and a high degree of perfection in product, and therefore, no doubt, would encounter the intensest opposition from the advocates of the dead-level, all-share-alike idea in labor unionism.

The problem is not an easy one; but it is one that is properly engaging the effort of the best students of shop administration. One thing is certain: Those who oppose the principle of reward according to amount and quality of service rendered are resisting the inevitable. Competition rules out the benevolent idea of a per capita wage system. Energy should be directed to perfecting the piece price system and reducing to the least the chances for injustice under it, rather than toward its abolition. In some form it is here to stay.

IRON AND STEEL STOCK MARKET.

Denison, Prior & Co., of Cleveland, say in their weekly letter on the iron and steel stocks: "Up to the present time, Monday, Sept. 4, the action of the listing committee of the New York Stock Exchange in placing the issues of the American Steel & Wire Co. on the regular list has failed to bring forth the favorable results that had been anticipated by the friends of the company. The stocks in question, have not only failed to show the expected advance but have gradually declined in price. Some authorities assert that the iron and steel stocks will not meet with any further considerable advance. They base their opinion on the supposition that the present conditions prevailing in the industry are abnormal. The present year is an abnormal one in the iron industry; but the year 1894 was also an abnormal one, though in a diametrically opposite way. It would be as unfair to judge values on the condition that prevailed in '94 as it would be to form an opinion of the future of the iron and steel stocks on the conditions now existing. The law of averages plays just as important a part in estimating the future value of securities as it does in any other proposition to which an average can be applied. To get at the true value of a stock the earnings for a series of years, that include seasons of adversity as well as times of prosperity, should be taken into consideration. If it can be demonstrated that the constituent companies of a given consolidation have returned profits to their stockholders through a series of years it would require but little to demonstrate that the consolidation companies with the decrease in operating expenses naturally resulting from consolidation, will, under an equally careful management, return, not only as great, but probably greater profits to the owners of the securities.

"To a careful observer of conditions the argument that the steel and iron consolidations are at the present time in their infancy, is a poor one. There are many benefits to be derived from consolidation and it is not to be supposed that the management of the various consolidations in the iron trade is not sufficiently astute to take advantage of all the economies that the system makes possible. It is for these reasons that we feel that the preferred issues of the iron and steel combinations will see better prices. Taking the preferred issues as the basis and leaving the common stock out of the question, there is no reason to suppose that the future holds in store years sufficiently adverse to prevent the earning of dividends.

"In the abnormally prosperous years the common stocks may get a division of profits but the careful investor will pin his faith to the preferred issues of the more conservative companies. The issues of the Republic company were again the prominent feature of last week's trading. The price of the combined issues rose to 109, three points higher than the record price, 106, for the subscriptions. The stock of the Colorado Feul & Iron Co. is attracting considerable attention and its friends predict a marked rise in the quotations for it."

Fluctuations of the Past Week.

The following table shows the fluctuations in iron and steel stocks in the week ending with Monday, Sept. 4, and in the present year:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy	17⅛	17¾	17	17	21⅞	May 25	15	June 15
Am. Car & Fdy pr	67	67⅛	67	67	68¼	Aug. 1	56⅜	June 16
Am. Steel & Wire..	57½	59	56⅛	57¼	72	May 4	45	Feb. 8
AmSteel & Wire pr	98	99¼	98	98	106¾	Mar. 13	92½	Feb. 8
Am. Steel Hoop.....	38½	39¾	38½	38¾	41¼	May 3	24	May 24
Am. Steel Hoop pr	83⅛	84½	83½	84½	84½	Aug. 31	70	May 13
Am. Tin Plate.....	43	44⅞	43	43⅝	52¾	April 4	33	May 24
Am. Tin Plate pr..	91	91¾	90	90¾	99⅛	Feb 8	81	June 1
Federal Steel.....	59	61¾	58½	60¾	75	April 3	46⅜	Feb. 8
Federal Steel pr....	81⅛	83	81½	81¾	93¼	April 3	72½	May 13
Col. Fuel & Iron...	48½	52¾	48	52	55	Apr. 21	30⅝	Feb. 8
National Steel.....	56	56⅞	55	56	63	April 24	43¾	June 1
National Steel pr..	97¾	98⅞	97¾	97¾	99⅜	Aug. 11	85	May 25
Pressed Steel Car..	56¾	59⅜	59¼	59⅜	61¼	Aug. 15	44¾	June 1
PressedSteelCar pr	89	89⅞	89	89¾	90	Aug. 19	78	May 25
Republic Steel	23½	30	23¼	30	30	Sept. 2	22½	Aug. 28
Republic Steel pr..	74½	79	74¾	77¾	79	Sep'. 2	74¾	Aug. 28
Tenn. Coal & Iron	97¾	99½	95½	99½	100	Aug. 21	36	June 14

It is stated that the Pressed Steel Car Co. contemplates building a plant in Russia for the manufacture of steel cars, especially for the new trans-Siberian Railway.

LAKE SUPERIOR IRON MINES.

Deeds just filed in the name of D. H. Bacon, president, indicate the purchase by the Minnesota Iron Co., of two Mesabi range properties—the Iron Chief mine in sections 17, 18, 19 and 20, in St. Louis county, comprising about 200 acres, for the sum of $120,000, and also the undeveloped land of the Monarch Iron Co., amounting to 11,000 acres, for $65,000. The lands of the Iron Chief Co. transferred are the northwest quarter of the southwest quarter, and the south half of the southwest quarter of section 17, lot 4 of section 18, lots 1 and 2 of section 19, and the northwest quarter of the northwest quarter of section 20, in 58-19. The Iron Chief is an underground proposition. The ore is about 70 to 90 feet below the surface and it will grade generally as Bessemer. Some development work has been done, but the property has not been worked. The Monarch lands have been known as the lands of the Cloquet Lumber Co., and they contain about 11,000 acres. They are entirely undeveloped, although some prospecting on them has been done.

A fourth ore road in Minnesota is promised by the filing of articles incorporating the Virginia & Ely Railway Co. The capitalization is $1,000,000 and the incorporators are Henry W. Oliver, of Pittsburg, C. W. Baker, New York sales agent of the Carnegie Steel Co., Ltd., George T. Oliver, H. M. Curry, James Gayley, D. M Clemson, Charles D. Fraser, of Pittsburg, and C. A. Congdon, of Duluth, the latter attorney for the Oliver-Carnegie interests in Minnesota. The general statement concerning the new road is that it will run from Virginia to Ely and thence in an easterly or southerly direction to a point in Lake or Cook county, presumably to some harbor on Lake Superior. The personnel of the incorporators indicates that the road is to be built to haul the ore of the Oliver Iron Mining Co. Whether the outcome of the incorporation will be a reduction of rates by the existing ore roads or the actual building of the new line time will develop. On the Gogebic range, the discussion of the possibility of a new and more direct line to Lake Superior to haul the ore of the Oliver interest led to a reduction in rates.

Indiana Industrial Notes.

Chas. H. Lawton, of Wabash, Ind., foundry and school furniture, employs 30 men and reports an increase of 50 per cent in business over last year. His patent dovetail fastener for desks has met with much favor and is used on all of his school furniture. Mr. Lawton has been in business 18 years and belongs to no trust or combination.

The Wabash Bridge & Iron Works, of Wabash, Ind., employ 50 men and report a decided increase in business over last year. They are at present very busy on bridge contracts at Hamilton, O., St. Louis and other points. The company was organized four years ago.

The Thomas-Albright Co., of Goshen, Ind., commenced business in 1870, and was incorporated in 1891. The company employs 25 men and makes a specialty of casting hydraulic presses for use in packing houses and other purposes. The trade this year is about double what it was one year ago.

The Bridge City Construction Co., of Logansport, Ind., produce heavy castings of all kinds within their capacity and report an increase of 50 per cent over last year's business. The force of 20 men is being worked night and day to keep up with orders.

The Fort Wayne Electric Works were reorganized last May and has a paid up capital of $500,000. They supply arc and incandescent light plants and report a growing business in all departments, especially in the installation of electric power equipment for shops, factories, etc.

The Kelley Foundry & Machine Co., of Goshen, Ind., was organized 12 years ago and now employs about 100 men. It manufactures grate bars, water tanks and general castings, but makes a specialty of boiler fronts. In the latter work the company has furnished some of the largest plants in the United States.

The tin mill of the Alcania Co., at Avonmore, Pa., is about completed, and the bar mill is to be started this week, followed at once by the two tin mills, which will have an output of about 3,000 tons a year.

REMOVAL OF MACHINERY TARIFF.

In *The Iron Trade Review* of April 6 was published with comment, a circular sent out by J. A. Johnson, president of the Gisholt Machine Co., Madison, Wis., to the machinery manufacturers of the country. Mr. Johnson asked the views of his correspondents on the advisability of abolishing the present duties on machinery imported to the United States. His own opinion was that the tariff, which he asserted was now no longer needed for protection, was likely to provoke retaliatory tariffs and thus hamper our manufacturers who have made so good a beginning in their foreign campaign. On this point and on others related to it we expressed ourselves in connection with the reprinting of the circular letter. The Gisholt Machine Co. has just sent out the following letter to those who responded to the original inquiry:

Madison, Wis., Aug. 25, 1899.

GENTLEMEN:—Having received numerous replies in response to our circular letter of March 22, relating to reduction of tariff duties on machinery, it occurs to us that those who received the circular may desire to know something of the nature of the replies.

Of those received about 20 per cent say that the writers have not the time to consider the question, or are neutral, about 20 per cent are opposed to reduction or change, and about 60 per cent are in favor of material reduction in the duties on machinery, or of placing it on the free list. If those who are neutral or undecided are divided in the same proportion as those who declare themselves, those who favor tariff reduction or free trade in machinery embrace 75 per cent of all who have sent replies. Considering the fact that nearly all manufacturers either are or have been protectionists, it shows a decided change in regard to the tariff. It should be remarked that among those opposed to change, are some of the leading concerns of the country, as well as among those who favor it. However, among those who favor a change, are many who have themselves spent considerable time abroad inthe interest of our business. We of course are not authorized to publish the names of the writers of the letters, but we do not believe there is any objection to the printing of the letters in a trade paper (several have applied for them), if no indication is given as to the authorship. It should be noted that our circular letter was sent only to machinery manufacturers, and to but a limited number of them, and the replies are from machinery manufacturers only.

The Question of Retaliatory Tariffs.

Among the opponents of tariff reduction are two who think retaliatory tariffs would be beneficial to this country. One thinks that our export of agricultural machinery has worked serious injury to us; the other that foreigners getting our tools will copy them, thus improving their methods, and in time they will invade our own home markets, if not shut out by our tariffs. These parties do not seem to realize that it is impossible for us to prevent foreigners getting our machinery to copy. A very considerable number of foreigners are constantly traveling in this country, to see what they can learn, and to find machines that they can profitably copy. Such men are usually freely admitted to our workshops, and they certainly profit by their observations. Not unfrequently do they employ some of our best engineers and mechanics.

It would hardly seem that American prosperity will find a safe resting place on the policy of exclusion and seclusion. Such has never been the policy of the intelligent protectionist. His theory has been that when our industries are once firmly established, protection becomes superfluous, other things being equal. The difference in labor cost might still make protection necessary in a measure.

But if the difference in the price of labor is made up by other advantages, still protection may be superfluous. Our abor is certainly more intelligent. It is better fed, better clothed, better housed. It therefore should be, and is, more efficient. And we have other advantages which our foreign competitors lack. We have cheaper food. We have greater natural resources. We have cheaper railroad transportation. We are free from exacting military service. Our taxes are much lighter. Our people need learn but one language; in Europe many must learn several languages. We have a uniform money unit throughout the continent. Europe has a good many, which enables bankers and brokers to levy heavy tolls upon business. There trade restrictions between the numerous nationalities are embarassing and burdensome. Our free intercourse among the States has an advantage we hardly appreciate. Here a part of the same machine is frequently built in Connecticut, and another part in Wisconsin. This free intercourse enables us to specialize, and greatly reduce the cost of production. The difference in languages, railroad systems, tariffs, money systems, etc., greatly hamper specializing in Europe, and always will.

This the Greatest Manufacturing Country.

America is bound to be the great manufacturing country of the world. We have the conditions. Protective tariffs are the swaddling clothes of the youngster. We are rapidly outgrowing them. They are still necessary in some branches of our industries. In the higher grades of textiles, for instance, we are yet far behind some of our competitors. And these higher grades are also among the luxuries, and can well bear heavy duties, even if for no other purpose than revenue. England employed the policy of protection for a very long period, to place her industries on a firm basis, and then abolished it. This policy has made the little island the most powerful, the wealthiest, and at least until recent years, the most progressive nation in the old world. May we not profit by her example? If that policy has made Britain what she is, what may not the same policy work out for this country?

There is one branch of manufacture that yet sadly needs encouragement from our Government, that of ocean shipping. In regard to this industry our policy has been most unwise and niggardly. Liberal aid should be granted to this most important industry; important not only in itself, but of vast importance to so many of our other lines of production.

The tariff should be modified by the friends of the protective system, just as it was in England, not by the enemy of all protection. It will then not shake public confidence, or cause even business depression. Every business interest fears violent and radical changes, even when the tendencies are right A wise policy henceforth will rapidly and unerringly open the markets of the world to American genius, skill and vigor. We cannot hope to crush all competition, nor is it advisable that we should do so. But we can fully hold our own. We can do more. We not only gain in the foreign markets of our European competitors, but we invade the busiest home markets of our ablest and most progressive competitors, and in these markets our trade shows the greatest gain. It is to be hoped that a fair and intelligent discussion of this most important subject will lead to such action on the part of Congress as will promote the best interests of the country.

GISHOLT MACHINE CO.,
JNO. A. JOHNSTON, Pres.

Cableway for Coaling Vessels at Sea.

The Lidgerwood Mfg. Co., of New York, manufacturer of hoisting engines and cableways, has constructed a special form of cableway adapted for coaling vessels at sea, in which the Navy Department has shown considerable interest. A contract has been entered into by the Navy Department and the Lidgerwood Mfg. Co. to equip the collier Marcellus with one of these sea coaling cableways, and a board of naval officers will try the device at sea. Acting Secretary Allen has ordered the Marcellus to be towed from Norfolk to the New York Navy Yard, and upon the arrival of the vessel, the Lidgerwood company will immediately install their apparatus. This work will be under the direction of Naval Constructor Bowles. In the employment of this device, the warship may take the collier in tow, or the collier may take the warship in tow, leaving a space between the ships of 300 feet. Elevated cables, leading from the mast head of the collier to shear poles on the warship, serve to support and propel a carriage, from which hangs bags of coal. The coal is elevated from the deck of the collier, transferred to the carriage at the mast head, and propelled across the intervening space at a speed of 1,000 ft. per minute. The arrangement for compensating for the lurching of the vessels in seaway is ingenious. It has been tested on a small scale, and there is little doubt as to the working of the appliance at sea. Coaling can be carried on while the ships are moving ahead.

USE OF FINELY-DIVIDED IRON ORE.*

BY PROF. J. WIBORG, STOCKHOLM.

By the introduction of magnetic and other methods of separation, the power of enriching or improving iron ores by the removal of barren or undesirable constituents, has been greatly increased; and by the use of such methods the waste in working, in the case of magnetic minerals, at least, can be considerably diminished. The advantage arising from such operations is, however, largely qualified by the circumstance that the product or concentrate is usually obtained as a comparatively fine powder, which limits its utility to the smelter when compared with that of similar or even poorer ores obtained in larger masses, and therefore the question of how such material can best be applied is now becoming of importance. Powdered iron ores obtained by concentration may be utilized in several different ways, namely: (1) By direct addition to the charges in the blast furnace; (2) by agglomeration previously to charging in the blast furnace; (3) as a refining or softening material in the open-hearth furnace; (4) for the production of sponge iron for use in the open-hearth furnace, which uses will be considered in the above order.

I.—Direct Use in the Blast Furnace.

The proportion of small ore that can be used in the blast furnace is subject to variation according to the conditions of fuel and working, but cannot, in most instances, be very large, limits being imposed by the tendency of the material, especially if it is of high density, such as pulverized magnetite, to overrun the fuel charge and come down to the tuyeres in an imperfectly reduced condition, as well as to form accretions or scaffolds by adhesion to the furnace walls above the hearth. As an example of the behavior of concentrates, the results of experiments made in 1898 at the blast furnace at Vidlitz, in the government of Olonetz, in Russia, will be given. These were conducted by Dr. H. Blankett, an experienced metallurgical engineer and graduate of the School of Mines in Stockholm. The materials smelted included concentrates obtained by magnetic separation from a lean magnetite at Valimaki, in Finland, poorer magnetic ores in lumps from the same place, and bog ores from Taipala, of the following composition:

	Oil concentrate Valimaki.	Lump ores, aalimaki.	Bog ore, Taipala
Fe_2O_3	—	—	48.30
Fe_2O_3	72.32	51.48	—
SiO_2	11.26	21.70	19.74
TiO_2	4.65	7.40	—
Al_2O_3	4.81	2.07	2.47
MnO	0.19	0.13	4.72
CaO	4.00	7.65	1.81
MgO	4.42	8.14	trace
P	trace	0.03	0.87
S	0.99	trace	0.09
H_2O	—	—	20.00
Metallic iron	52.06	37.06	33.79

Cold blast was used during the trials, the regenerative heating stoves being under reconstruction, and the proportion of concentrate in the charge was gradually increased. Under these conditons no scaffolding was observed, but the descent of the discharge was often irregular, with the result of chilling and gobbing the furnace. This irregularity was most apparent when a charge of small-sized charcoal was followed by one or more of larger pieces; and when care was taken to ensure better sizing of the fuel, the furnace drove more regularly, and in the week from April 18 to 25, 1898 (O. S.), the ore concentrate was smelted alone without the occurence of any such irregularity. From this it appears that in the smelting of rich and heavy concentrates, the coal should be used in smaller pieces than is necessary with finer materials of a less dense character, such as lake and bog ores, purple ore, etc. This combination, can, however, only be successfully handled in furnaces of small height, as in a tall furnace the close packing of the charge is necessarily attended with slow driving and unduly large production of carbon mon-oxide, from the prolonged contact of the gas from the reducing zone with the fuel above.

*Read before the Iron and Steel Institute, Manchester meeting, August, 1899.

Irregularity due to Adhesion of Ore to Stack Wall or Scaffolding.—It is a matter of general experience that finely-divided ore and ore dust readily adhere to the heated wall of the furnace, and gradually accumulate into large masses, which, falling into the region of the hearth when detached by the pressure of the column of materials above them, meet with an insufficient body of fuel to effect their complete fusion, with the result of producing "cold" iron or choking. This tendency to form accretions or scaffolds is the principa cause restricting the use of powdered ore in large quantity in blast furnaces, but there are certain distinctions to be made; thus the tendency to scaffolding is greater with small than with large ore; with small-grained ores of equal size it is greater with those of lower than higher density, and with those containing fusible minerals greater than with those carrying waste constituents of a refractory character. Other conditions influencing the result are the greater or less steepness of the bosh walls and the more or less refractory character of the materials used in the stack lining. In the case previously referred to at Vidlitz, the slope of the boshes above the tuyeres was 75 degs., which at a higher level was reduced to 70 degs., a section which would *a priori* be considered as extremely unsuitable for the use of powdered ore. Nevertheless the furnace worked satisfactorily even on concentrates alone, so long as cold blast was used. When, however, the stoves were repaired, and the blast was heated to 450 degs., or 500 degs. C, scaffolding began, and continued with little alteration until the hearth and tuyeres were burnt out, and no improvement was experienced even by reducing the proportion of concentrate in the charge to 30 per cent. The difficulty was attributed to the intense local heating of the hearth and boshes by the blast, causing the finely divided ore to stick to the wall of the furnace, but it was considered that the fine dust of the bog ore was a greater source of trouble than the dense magnetite.

As a preventative of scaffolding with the materials under consideration, furnaces with cylindrical stacks or a bosh angle of 90 degs. have been suggested, but it is easy to see that the use of such a section would be attended with considerable difficulties. Notably the furnace must either be of small dimensions, or, if of a large capacity, it would be unreasonably wide, and the rapid driving necessitated by such a form would be suitable to the production of pig iron for forge use, or the production of malleable castings rather than a more siliceous or manganiferous metal; and even though magnetic concentrates may be somewhat more easily reducible than similar ores in lump form, it is doubtful whether it could be advantageously used under the conditions of forced driving called for by the cylindrical form of stack.

Rich and heavy concentrates or small ores have, however, been used without difficulty on several occasions; as, for example, at the old works of Hogfors, where concentrates obtained by washing from the leaner ore of Norberg were used to the extent of 30 per cent, and at the Bagga furnace of 25 per cent, the latter being obtained by magnetic separation with the Grondahl separator. Certain ores from Grangesberg, when crushed after roasting, also readily fell to pieces, but no great inconvenience has been experienced in them. The author is, therefore, disposed to consider that the addition of concentrates up to about 50 per cent of the charge may be regularly carried out in furnaces with the bosh angle of 83 to 84 degs. The washing of powdered ore with a view to increasing its reducibility is of less consequence than with the same ore in lumps, except, of course when it contains sulphur when it becomes necessary. At Bagga the concentrates are roasted in a small reverberatory furnace. Another inconvenience attending the use of powdered ore is the loss caused by dust in the gases, and in this respect the cylindrical stack would be most disadvantageous on account of the velocity of the upward current in the stack, which would necessarily be greater than in a furnace of smaller bosh diameter. At Vidlitz, when the charge consisted of magnetic concentrates and bog ore only, from 8 to 10 per cent of the powdered ore was carried over into the gas conduits.

II.—Agglomeration Before Smelting in the Blast Furnace.

In order to avoid the inconveniences attending the use of

small ore in the blast furnace, numerous methods have been proposed and tried, more or less successfully, for consolidating it into coherent masses or lumps as a preliminary to smelting. This may, in certain cases, be done without the addition of foreign matter, but, as a general rule, some binding material is required. There is a tolerably wide range of choice among the substances that can be used for this purpose. One condition, however, is necessary—namely, that nothing shall be used that would be injurious either to the product or detrimental to the working of the furnace, which excludes such a substance as gypsum, as likely to introduce sulphur into the iron, or magnesium chloride, which, by bringing chlorine or hydrochloric acid into the blast furnace gas, would be destructive to the iron work of the stoves and boilers. The principal methods that have been practically tried are as follows:

Agglomeration by Heat alone without Binding Material.—Powdered ores that are not particularly rich and contain easily fusible silicates, such as horn blende or pyrooxenic minerals, may be made to cohere by heating in a reverberatory furnace up to the point necessary to produce incipient fusion of these accesory minerals; but to obtain a similar result with rich magnetic concentrates it would be neccessary first to mix them with such a material as, for instance, with easily fusible blast furnace slag. Such methods are, however, costly, as the temperature to which the mixture must be heated is higher, and the time required is longer, than is necessary in the ordinary method of ore calcining. They have been used at the Cornelie mine at Stollberg, and at Valimaki, in Finland. The powdered ore is mixed with water, and the damp mass is molded into bricks, which, when dried, are sufficiently coherent to be charged into kilns and burn to masses of considerable strength and hardness. The best result are obtained when the ore, which should be in a very fine powder, is not very rich, containing 50 or at most 60 per cent of iron, the remainder being fusible silicates. This has also been tried experimentally at Vidlitz, the mixture being molded into small cylindrical masses, which are burnt with charcoal dust in the Schedinska kiln, which is generally used in the locality for calcining iron ores. At Stollberg the finely powdered ore obtained by washing was molded into bricks and subsequently burnt.

Consolidation of Small Ore with Lime.—Caustic or slaked lime tempered to a stiff paste with water is the best binding material for powdered iron ores, especially for those containing a notable amount of iron silicates or silica. Briquettes made with such materials become harder by continued exposure to the air, first by the conversion of the lime into carbonate and subsequently into silicate, and the intimate mixture of the reducing and fluxing material in the mass tends to facilitate working in the blast furnace. For this latter reason, in the treatment of differently reducible silicates, such as heating furnace slags, it is sometimes found convenient to grind them to powder and mix them with lime and charcoal dust into briquettes, in order to furnish a slag suitable for smelting in the blast furnace.

Agglomeration of Ore with Carbonaceous Material and Coking.—It has long been known that pulverulent materials, when mixed with tar pitch, or bituminous coal and strongly heated, give, when cooled, hard and compact masses. This was applied by Weissman about 10 years ago, in the production of so-called ore coke, which was made by mixing powdered ore with 20 per cent of coal dust and 5 per cent of pitch, pressing the mixture into blocks, which were coked at a strong heat applied slowly. This, however, proved to be too expensive for practical use, but the idea has been revived in a simpler form—namely, mixing small coal and powdered ore together, and coking the mixture in the ordinary way. Experiments in this direction, made, at the suggestion of Mr. Carl Ericsson, by Mr. C. C. Dalerus, at the Islinge Coke Works, with the concentrated magnetite obtained at the Lulea apatite separating works, have given remarkably good results. The powdered ore, averaging about one millimetre in the size of the grains and containing about 70 per cent of iron, when mixed with 30 to 40 per cent of coal gave a product which was hard and compact, and could be quenShed with water in the same way as ordinary coke of good quality. By coking the ore was reduced to ferrous oxide with some metallic iron, and showed no great tendency to pass into a higher state of oxidation even when exposed to the air for a considerable time. With easily reducible ores, however, it is probable that there would be a larger production of metallic iron which would readily oxidize when quenched with water, or by long exposure to the atmosphere, with the result of diminishing the strength of the coke.

The author is, however, favorably impressed with the results of the experiments made in Germany upon ore coking, owing to the simplicity of the method, and has considered the subject from the thermo-chemical point of view, in order to determine the possible heat requirements of the process.

Among the causes likely to produce irregularities in working may be mentioned the difficulty of so mixing the ore and coal as to ensure a product of uniform richness; the probability that such mixtures would contract less than coal alone in coking, so that there might be trouble in drawing the charge; and the scorifying effect of the ore dust upon the heated brickwork of the oven; while in the smelting furnace the possibility of such coke coming down the tuyeres unchanged with a partial combustion of the contained iron, as well as of the carbon, has to be considered. But as has been before stated, experimental evidence upon such points is entirely wanting.

III.—Use of Powdered Ore in the Open-Hearth Furnace.

Experiments on the substitution of powdered for lump ore in the open-hearth furnace were made by Dr. H. Tholander in the basic open-hearth furnace at Hogfors in September, 1897. The material used was the concentrated ore from the Lulea magnetic separating works, which contains 72 per cent of iron and 0.1 per cent phosphorus, the average size of the grains being about one millimetre. Four successive charges were made, the first three with pig iron, scrap, and ore concentrate, which was worked in the same manner as those, with the Kungsgruvfa lump ore currently used; while in the fourth, pig iron and ore concentrate alone, with some limestone were used, the final additions of ferromanganese and ferrosilicon being made in the usual way. The final charge consisted of 11.1 tons of pig iron, and 1.212 ton of ore concentrate, which quantity of metal should, according to previous experience, have yielded about 92 per cent of its weight in ingots, or 10.212 tons as a maximum. The actual weight obtained was, however, 10.874 tons, showing an excess of 0.662 ton, recovered from the 1.212 ton of ore added, corresponding to a reduction of 57 out of the 72 units, or a utilization of 75 per cent of the iron contained in the ore. The time required for working this charge was about one-half more than when scrap was used; but Dr. Tholander considers that, with longer experience of the method, this might probably be reduced, and also that it would be possible to increase the amount of ore used from 11 to 15 per cent of the weight of the pig iron.

The composition of the ingots was as follows:

	Per cent.
Carbon,	0.12
Manganese,	0 33
Phosphorus,	0.027
Sulphur,	0.003

Another application, due to Mr. H. Brinell, is an improvement on Ellershausen's process of incorporating the ore with the pig metal at the moment of casting. An ingot mold is partly filled with fluid metal from a ladle, and when it is about to solidify a quantity of small ore is thrown upon the surface, and this is repeated until the mold is full. From 12 to 15 per cent of ore can be added without notably diminishing the cohesion of the ingots which are to be used instead of pig iron in the open-hearth furnace charge. Rich and heavy concentrates are admirably suited for this use.

IV.—Direct Reduction of Pulverulent Ores.

As it is possible to obtain concentrated ore containing more than 70 per cent of iron, and practically free from earthy waste, it seems to be an unnecessarily circuitous proceeding to convert it first into pig iron when soft iron or steel is required, such material being especially well suited for direct reduction to sponge iron capable of replacing scrap in the open hearth furnace. For this purpose the author has designed the furnace. [The paper gives details with accompanying illustrations of this furnace. It contains a heating chamber in which the powdered ore supplied from a storage

hopper is brought up to a high temperature by a spent flame and a reducing hearth, with a hopper for supplying charcoal dust. The system of heating is described in detail. After final reduction with charcoal, the sponge iron appears as a granular aggregate of small coherent masses of iron. This is drawn out of the reducing chamber and dropped through a passage, into a receiver where it is cooled in the gas current from the producer. When cold, it is removed by a door at the bottom. The reduced material, which is only very slowly changed by exposure to the atmosphere, consists of a mixture of iron and charcoal powder, which can be removed by an air blast or a magnetic separator. For use in the open-hearth furnace it may be packed into cast or sheet iron cases, or compacted by pressure into masses to take the place of scrap in the charge.

ENGLISH PIG IRON CASTING MACHINES.

The Hawdon and the Wainford machines for casting and conveying pig iron have been described lately in our English exchanges. The latter was described by its designer, R. H. Wainford, in a paper before the recent Manchester meeting of the Iron and Steel Institute.

The Hawdon Machine.

Wm. Hawdon, manager of the Newport Iron Works, at Middlesborough, Eng., will be remembered as the inventor of the Hawdon slag conveyor, in use at a number of blast furnaces in the United States. He has brought out, also, a pig iron casting machine, of which the slag conveyor is the suggestion. The general design of the pig iron casting machine is much the same as of the slag carrier, but it has been arranged more particularly to deal with iron, and with a view also of keeping the molds dry on their return for refilling, they are not to be dipped in water, as is the case in the machine which deals with the slag. Thus, a secondary machine of circular construction, as shown in the drawing, which is reproduced from the *Engineering and Mining Journal*, is used for the cooling process. This machine is well balanced and of simple construction, and the lifting of the pigs from it into the trucks is done by a sort of Jacob's ladder. The weight, however, of the pigs is mainly sustained on its ladder by a structure of rails or bars, so that the wear of the

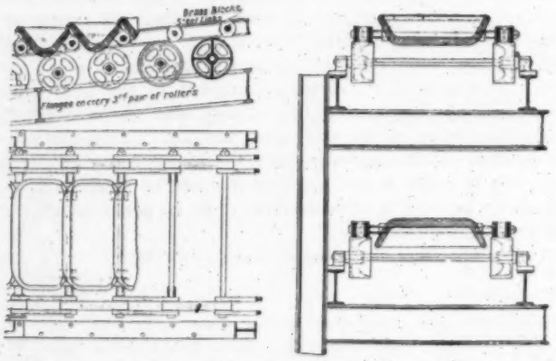


FIG. 1.—THE HAWDON PIG IRON CASTING MACHINE.

ladder is greatly reduced. Mr. Hawdon in designing his machine has kept in view the necessity for minimizing wear and friction, and has sought to construct an apparatus which is at once mechanical in its action, and, being well and sufficiently lubricated, is as frictionless in its motion as possible. The great difficulty with which machines dealing with molten metal have to cope is the heat, and they must therefore be made very strong and substantial, in order that they may suffer as little as possible from the expansion to which they are subjected and from the weight carried. The tightening of the parts of the machine caused by the heat, and the excessive wear and tear resulting from that, as well as from the lack of lubrication, have proved serious impediments, in this country at least, to the adoption of machinery for casting pig iron, and dealing with it afterwards by mechanical appliances instead of hand labor.

A reference to the illustrations will show that in this machine there is a series of molds of the ordinary shape for casting pig iron, and these are fixed onto a traveling belt or chain. There is cast on each mold a lip, which prevents the flowing iron from falling between the molds as they pass in succession under the spout of the tilted ladle. The weight of the molten iron in the molds, together with that of the molds themselves, and also of the chain or the conveyor, is considerable. The conveyed and radiated heat from the fluid metal in the molds dries up and heats the chain and rollers, and to work these without any lubrication would necessitate heavy cost in renewals and repairs. But Mr. Hawdon has adopted special means for overcoming this difficulty. He has placed his roller bearings at such a distance from the heat as to allow of lubricants being freely used; and all bearings are of brass and thoroughly lubricated. The pulleys also, are placed at frequent intervals, so that the wear on the chain pins or connections may be as small as possible. This applies as well to the circular conveyor on which the pigs are cooled. It is important to notice that all bearings are above water, easily accessible, and being removed from the heat are well lubricated.

In regard to the removal of the pigs from the circular conveyor to the truck or bogie, it is stated that as they move round under water with the machine they come in contact with a fixed plate or plow, which pushes them off the entablature on to an elevator, and this deposits them in a truck placed alongside. Instead of the circular conveyor for cooling the pigs, a straight belt or traveling band may be used, on to which the pigs may be tipped. This band is dipped through water to cool the iron on it, as in the machine as applied to slag, and from the belt it can be tipped into trucks. From leaving the furnace to being deposited in the trucks, the amount of hand labor required is small.

The Wainford Machine.

A casting machine of the Wainford type capable of dealing with 60 tons of iron per hour comprises a 15-ton ladle, and a central inclined ladle-track, narrow-gauge railways being placed on either side of the ladle-track, upon which is traveled a controlling vessel which is attached to the ladle by an arm. These narrow gauge railways are placed horizontally, and at the outer side of them a line of 40 molds is also placed horizontally; and underneath each line of molds is run the wagon lines, on which stand wagons to receive the contents of the molds. The full ladle is brought to the lower end of the inclined ladle track. The controlling vessel is then attached to it, and both are hauled, by means of a wire rope, along the line of molds; at the same time the operator gradually tilts the ladle. The idea of the inclined plane is to avoid splashing of the molten metal, as by its use the lip of the ladle is kept low down and in a constant position with regard to the controlling vessel. After the metal has remained in the molds a short period, the molds are tilted over in pairs by hand-gearing and their contents delivered to the wagons.

The molds are constructed in a light corrugated form, and are placed in semi-circular castings, leaving a cavity or space between the molds and the casings, in which is placed suitable non-conducting material. The corrugated form of the mold gives strength with lightness; and the question of lightness, combined with the non-conducting material, constitutes one of the chief points devised to avoid the chilling effect, and therefore preserves the texture in the iron. The molds are made detachable, and by releasing the bolts at each end of the casing, may be readily taken out and replaced. The casings holding the molds are fitted at each end with trunnions, upon which they are revolved when required to be discharged. A locking gear is provided, and the spaces between the molds close automatically during the operation of casting. By these several means a continuous cast is obtained, the molds are held perfectly still while the metal is solidifying, thus avoiding mechanical action during that period, and by insulating the molds the chilling effect is also avoided. This machine has few working parts; the molds may be cheaply and easily renewed, and the cost of maintenance will therefore be a small item.

In the course of experiments it was found that ten minutes was a sufficient time for the iron to set in the mold, and be ready for tilting over; so that with 40 molds in a line a capacity of from 15 to 16 tons is provided for. Taking each mold as containing about 8 cwt., and as ten minutes has proved sufficient time to allow the iron to change from the fluid to the rigid state and to be discharged, there should

be no difficulty in filling the molds every half hour; and taking the two lines of molds the daily capacity would reach 1,440 tons. It is generally considered that a 15-ton ladle is the most convenient size; and provision should be made at the furnace for the necessary number of ladles to stand, in order to receive its maximum make. Under favorable conditions the molds used have made 30 trials each, and do not appear to be any worse for wear. The unfavorable conditions were that the molds were allowed to cool down between each cast; and in a machine casting every half-hour the temperature in the molds would never get below 450 degs. cent.; and by keeping the heat up in this way better fracture results would be obtained, and the strain due to contraction and expansion of the mold would not be so severe.

The space occupied by the plant described is 96 ft. long by 36 ft. wide. The power required is only that of a 5-h. p. hauling engine, or other motor, for the purpose of traveling the ladle and controlling vessel. The number of men requied to work this apparatus is as follows: One man tilting the ladle, two men luting and discharging the molds, one boy attending to engine or motor. On the assumption that these workmen have eight-hour shifts, the labor cost will be about ½d. per ton cast. In conclusion, it may be added that, when required to load into main line wagons, side-tipping bogies would be used for receiving the contents of the molds, and these would gravitate to a suitable point for discharging into railway trucks as suggested. If more convenient, conveyors might be placed underneath the line of molds, which would raise the pigs to a sufficient height to allow of their being discharged into main line wagons, etc.

THE National Elastic Nut Co., Milwaukee, Wis., has just finished an addition to its plant which doubles its capacity. The company finds it impossible to keep up with its orders, the demand has been so large of late. The National elastic nut is made of spring steel cut from a bar, the ends being cut to form a dovetail joint when brought together by bending the flat strip into a ring. This ring is then pressed into hexagon shape. The nut is tapped slightly smaller than the bolt, so that when it is put on with a wrench it opens about 1-64th of an inch, and a grip on the bolt is developed with the fiber of the metal running around the nut. The nut can be slackened or tightened and used over and over again, the grip causing no injury to the threads of either the nut or the bolt. The nuts are in use in many places, with excellent results. They are especially adapted to railroad and machine work.

A SIXTEEN-FOOT PLANER.

The New Haven Mfg. Co., New Haven, Conn., manufactures among other machine tools, planers, some of which are unusually heavy and of special dimensions. The company has in its works a planer of its own make, with a table 36 feet large, and a bed 53 feet long. It planes 72 inches square. Some time ago the company furished a planer to plane nine feet square. The planer illustrated below is known as the company's No. 2 machine, planing 10 feet, inside the pockets, 40 inches wide and 40 inches high. It is designed for heavy work, having beds of special depth and width, strongly braced; a table wide and thick with deep ribs; the three T-slots planed out and the holes drilled. The driving motion is by two belts, one on each side of the machine, giving a steady motion. The gearing is entirely within the bed, mounted on short steel shafts of large diameter, running in cap boxes, and the gearing and journals are protected from chips and dirt. The cross bars are deep and strongly braced, with sliding surfaces scraped. They can be quickly raised or lowered by power by friction clutch from the main driving shaft. The cross feed screws are cut with double threads, giving rapid adjustment, and the bronze cross feed nuts can be taken out, when necessary to renew them, without removing the saddle from the cross bar. The heads have automatic power feeds in all directions—vertical, cross and angular—are under full control of the operator from either side of the machine, and can be adjusted in any direction without disturbing the feed pawl. They also start or stop the planer from the back side. The table can be run back to examine work without changing the position of the dogs; and the feed can be instantly changed from nothing to the coarsest without stopping the planer. Driving pulleys on the counter-shaft are 16 inches in diameter, 4¼ inch face, and should run 141¼ revolutions to give a cut of one foot a minute.

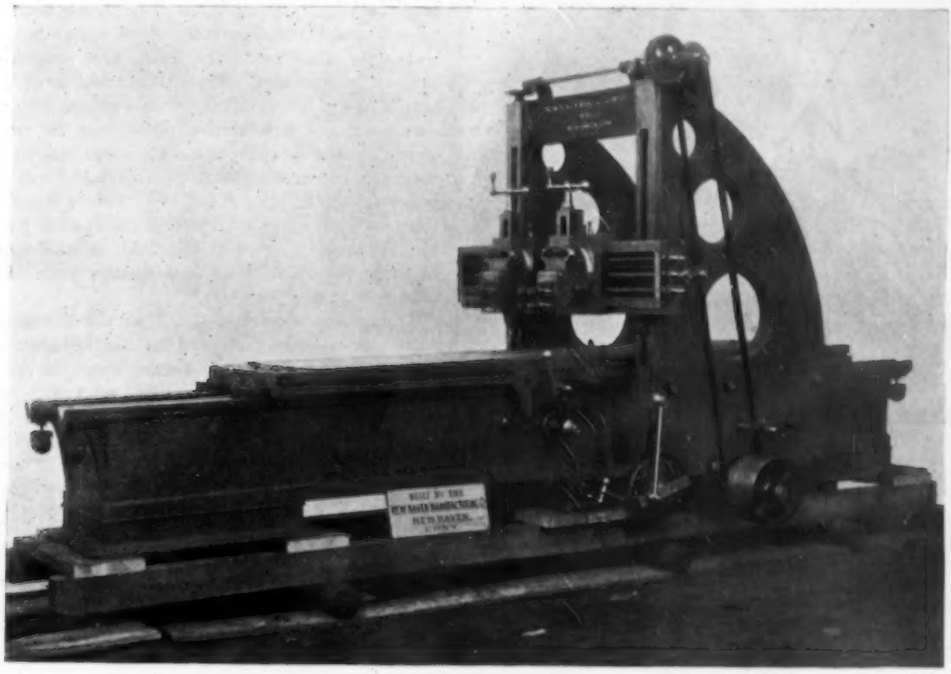


FIG. 1.—A SIXTEEN-FOOT PLANER.

VOL. 55, the first of the 1899 volumes of the Journal of the Iron and Steel Institute, edited by Secretary Bennett H. Brough, has just been issued. The proceedings of the Manchester meeting of the Institute, in May, 1899, come first, followed by the usual review of the literature of the half year pertaining to the metallurgy of iron and steel. This feature of the Journal is handled with conspicuous ability.

The Acme Machinery Co., of Cleveland, recently exported seven cases containing bolt and nut machinery to Schuchardt & Schute, of Berlin.

RAYMOND ROLLER GRINDING MACHINE.

Machinery for crushing, grinding and pulzverizing operations are more and more in demand, as processes for the utilization of heretofore waste material are developed, and methods of converting raw material into usable forms are improved. The Raymond horizontal roller mill, one of the newest forms of grinder, is shown in the accompanying illustrations. Fig. 1, which is reproduced from the *Engineering News*, is a cross-section showing interior construction. Fig. 2 is an elevation of the Raymond mill with the Albert Raymond vacuum separator attached. The separator is employed when fine grinding is to be done.

The construction of the machine is well indicated by reference to Fig. 1. Upon the vertical shaft A is keyed a cast-steel spider B, in which are journaled three or four mush-room-headed rolls C. The head of each roll is fitted with a crushing ring D, secured by the cap plate E, and a bolt passing lengthwise through the roll. The crushing rings D are normally in contact with the fixed crushing ring F, and the crushed product finds its way down between these contact surfaces. Should a piece of hard rock or some foreign substance, such as an iron spike or bolt, find its way into the mill, it would simply force the roll back, the roll moving

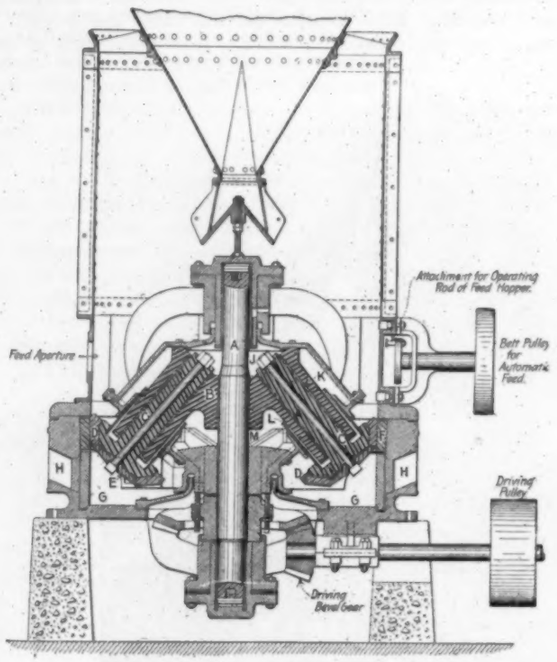


FIG. 1.—SECTIONAL VIEW OF THE RAYMOND CRUSHING AND GRINDING MACHINE.

diagonally upward in its sleeve-bearing in the spider. As soon as the obstacle has passed, the roll will return to position by gravity and by centrifugal force. The product falls through into the chamber G, meeting a current of air which enters at H, and passes upward through the mill. The air current carries up the "fines" to the separator, and the fineness of the "fines" can be regulated by varying the force of the air current. The coarser material, or "tailings," in the chamber G is raised by plows between the arms of the spider and delivered above the crushing rolls again. The plows come down within two inches of the bottom of the chamber, leaving a space in which any foreign matter will lie undisturbed until the mill is cleaned out. At J is an oil chamber, and the oil which passes down the sleeve bearings K of the rolls must return through the annular passage L into the chamber M. The shaft and spider make about 100 revolutions a minute, while the crushing rolls make about 250 revolutions in their sleeve bearings in the same period.

The journal boxes of the roller shafts being downwardly and outwardly inclined, cause the rollers to rest against the ring die by their own gravity, and as soon as set in motion the centrifugal force increases this outward pressure. It will be seen that as the rollers pass over larger pieces of the material or any other obstruction, the shafts carrying them must be pushed both upwardly and inwardly in the journal boxes which have an inclination of about 45 degrees. The force required to raise the weight of the rollers up this inclination and overcome the centrifugal force is all exerted on the material. The rollers do not bound and pound out the ring as when pendulum suspended, a valuable feature and one that largely increases the capacity of the mill. The rollers are caused to rotate on their axis by frictional contact with the ring die or the material under treatment, and the same journal boxes admit of a free bodily movement of the rolls while passing over any obstruction, thus avoiding all toggles and joints which are usually necsessary in a mill using a pendulum suspended roll. In many roller mills the scrapers or agitators are attached directly to the rollers which are usually the fastest running part of the mill. In the Albert Raymond roller mill the casting that supports the plow or scrapers is attached to the slow speed upright shaft, and but little power is required to raise the material and throw it between the crushing surfaces of the roller tire and ring die. The plows can be removed or adjusted by simply removing one of the doors and without taking the whole machine apart. The construction of the mill permits the faces of the roller tire to remain always parallel with the face of the ring die, a feature that no other mill contains.

Referring to Fig. 2 the construction of the separator will be underftood. The foundation A may be of concrete, timber or simply a strong floor. B is the roller mill and C the separator, which varies in size from 6 to 20 feet in diameter. The finer the product required the larger the separator. The exhaust fan is at D and the return air pipe is marked F. E is a galvanized steel dust collector and settling chamber which can be set higher if desired, so as to discharge into a storage bin. G is a galvanized steel housing around the mill to conduct the return air into the pulverizing chamber of the mill. H is a vent pipe to relieve back pressure or to relieve the system from any surplus air that might enter with the feed or any opening provided to admit fresh air. This pipe usually leads to a small dust room.

The International roller mill, as the Raymond machine is called, is especially adapted to the reduction of refractory ores, cements, phosphate rocks, graphite, talc, coke, coal, carbon, slate, limestone, gypsum, all burnt clays, sand, copper, zinc and lead ores. Where the wet method in the reduction of materials is required, the vacuum separator is dispensed with and screens substituted. The manufacturers are the Raymond Bros. Impact Pulverizer Co., 1402 Monadnock Block, Chicago.

First Steel Skeletons for Office Buildings.

The invention of skeleton construction in office buildings is being discussed among architects. The Society of Architectural Iron Manufacturers of New York lately placed a tablet on the Tower Building, 50 Broadway, New York, calling it the "earliest example" of what is now termed skeleton construction. Chicago architects object to this statement and claim the honor for Mr. W. L. B. Jenny, of Jenny & Mundie, of that city. They say that the first building of this type was the Home Insurance Bldg., of Chicago, erected in 1883-4. Mr. Bradford L. Gilbert, the architect of the Tower Bldg., denies this claim, and says that the Chicago building was of the "cage construction" type, with the iron work bearing the weight of the floors alone; while in "skeleton construction," the frame carries the weight of tthe walls and the floors to the foundation. The site of the Tower Building called out the design, says Mr. Gilbert, as it had a frontage of only 21 ft. 6 ins., and the building laws require a certain thickness of wall proportioned to the height of the building, that, in this case, would have left little room inside the structure. This building was completed in 1888-89. Previous to 1883 Mr. Geo. B. Post, of New York, had used cast iron columns to support the walls of the inner court of the Equitable Life Bldg., in New York. Mr. Wm. H. Birkmire, architect and engineer, the author of a work on "Skeleton Construction," published in 1893, supports the Chicago architects, and claims that he worked up the plans for the iron construction of the Tower Bldg., as engineer of the Jackson Architectural Iron Works, which obtained the contract for erecting this building. This Mr. Gilbert denies.—[Engineering News.

AMERICAN STEEL & WIRE COMPANY PROPERTIES.

In general the list of plants controlled by the American Steel & Wire Co. is known to the iron trade; but the official statement submitted to the governing board of the New York Stock Exchange, and on which the stock was admitted last week to the regular list of the exchange, gives details not heretofore published. It is an impressive showing and illustrates the vastness of the holdings of the more important iron and steel consolidations. The statement shows that the entire capital stock has been issued. Following is a list of the plants acquired, owned and controlled, apart from the company's vessel property:

The List of Plants.

American Steel & Wire Co. (Ill.)—Plants at Anderson, Ind.; DeKalb, Ill. (2); Evanston, Ill.; Joliet, Ill. (2); St. Louis, Mo.; Cleveland, O. (2); Salem, O.; Findlay, O.; Allentown, Pa.; Beaver Falls, Pa.; Rankin, Pa. Washburn & Moen Mfg. Co.—Plants at Worcester, Mass (2); Waukegan, Ill.; San Francisco, Cal. Worcester Wire Co.—Plants at Worcester, Mass. Cleveland Rolling Mill Co.—Plants at Cleveland, O; Newburgh, O.; and iron mine property at Negauenee, Mich. Indiana Wire Fence Co.—Plant at Crawfordsville, Ind. Garden City Wire & Spring Co.—Plant at Chicago, Ill. Consolidated Barb Wire Co.—Plants at Joliet, Ill.; Lawrence, Kan. Laidlaw Bale Tie Co.—Plant at Joliet, Ill. Cincinnati Barb Wire Fence Co.—Plant at Cincinnati, O. Union Rolling Mill Co.—(Only) plant at Cleveland, O., known as Emma Furnace. Portage Iron Co. (part), plant at Duncansville, Pa. Newburgh Wire & Nail Co.—Plant at Newburgh, N. Y. Allegheny Furnace Co.—Plant at Allegheny, Pa. Pittsburg Wire Co.—Plant at Braddock, Pa. Shenango Valley Steel Co.—(part) Plant at New Castle, Pa. Oliver Wire Co.—Plant at Pittsburg, Pa. Oliver & Snyder Steel Co.—Plant at Pittsburg, Pa. Shoenberger Steel Co.—Plant at Pittsburg, Pa., also coal land and coke ovens in Fayette and Westmoreland counties. Puget Sound Wire Nail & Steel Co.—Plant at Everett, Wash. Edgar Zinc Co.—Plants at St. Louis, Mo.; Cherryvale, Kan Puritan Coke Co.—Plant and land at Baggaley, Pa. Puritan Store Co.—Store at Baggaley, Pa. Clark & Saantry.—Mine at Virginia, Minn. Alpena Mine.—Mine at Virginia, Minn. Cuff Iron Co.—Mine at Iron Mountain, Mich.

The plants are all owned in fee except the following: Shoenberger Steel Co., Egdar Zinc Co., American Coke Co., American Supply Co., and American Mining Co. These concerns are controlled by stock ownership.

Monthly Capacity of Works.

The respective monthly capacities of the various properties are stated as follows. Wire rods, pig iron and steel are, as a rule, given in gross tons, other products in net tons:

Anderson (Ind) Works—6,300 tons wire rods; 5,200 tons plain wire; 1,500 tons galvanized wire; barb wire 750 tons; nails, 66,000 kegs.

DeKalb (Ill.) Works—Barb wire, 4,500 tons; field fence, 1,400 tons; nails, 50,000 kegs; wire, 4,200 tons; galvanizing, 4,000 tons.

Evanston (Ill.) Works—Field fence, 40 tons; poultry netting, 350 tons.

Joliet (Ill.) Scott Street Mill—Wire, 10,000 tons; barb wire, 3,000 tons; galvanizing, 4,000 tons; nails and staples, 100,000 kegs. Rockdale Mill—Wire, 6,000 tons; barb wire, 2,800 tons; field fence, 1,200 tons; poultry netting, 160 tons; bale ties, 14,000 bundles; galvanizing, 4,000 tons. Bluff Street Mill—Wire drawing blocks, 3,000 tons; nails, 16,000 kegs;

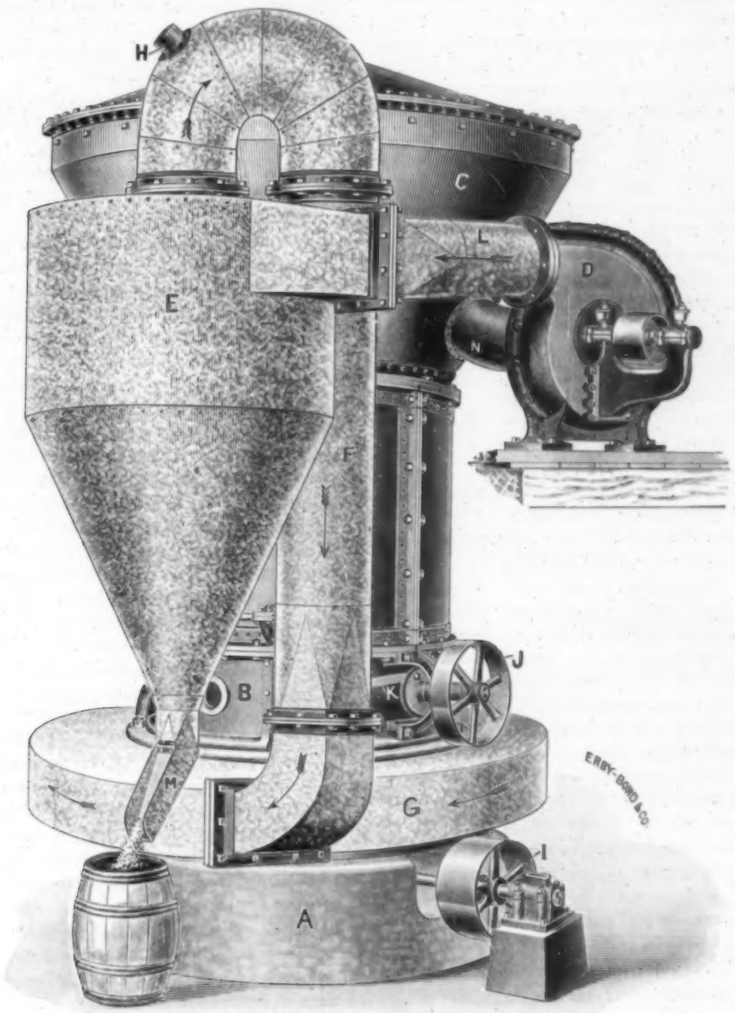


FIG. 2.—ELEVATION OF THE INTERNATIONAL HORIZONTAL ROLLER MILL WITH THE VACUUM SEPARATOR ATTACHED FOR FINE GRINDING

barb wire, 1,250 tons; field fence, 260 tons; bale ties, 5,000 bundles; staples, 200 kegs. Meeker Avenue Mill—Wire drawing blocks, 700 tons; bale ties, 50,000 bundles.

Chicago—Garden City Works—Wire, 250 tons; nails, 3,500 kegs; springs, 200 tons.

St. Louis (Mo.) Works—Wire, 3,600 tons; barbed wire, 1,750 tons; nails, 20,000 kegs; galvanizing, 2,500 tons.

Waukegan (Ill.) Works—Wire rods, 12,500 tons; barb wire, 1,400 tons; wire, 5,000 tons; galvanizing, 5,000 tons; bale ties, 19,000 bundles; staples, 1,200 kegs; and also mills for tinning, copperas, venetian red, etc.

Cincinnati (O.) Works—Wire, 4,500 tons; nails, 10,000 kegs; barb wire, 2,000 tons; bale ties, 3,500 tons; staples, 2,300 tons; field fence, 20 tons.

Central Furnaces (Cleveland, O.)—18,000 tons pig iron; with new blast furnace of 15,000 tons monthly capacity under construction.

Emma Furnace (Cleveland, O.)—6,500 tons pig iron.

Consolidated Mill (Cleveland, O.)—Wire rods, 7,500 tons; wire, 6,500 tons; barb wire, 2,000 tons; nails, 50,000 kegs; field fence, 250 tons; staples, 1,200 kegs; glvaanizing, 2,000 tons.

American Mill (Cincinnati)—Wire rods, 9,600 tons; wire, 4,500 tons; galvanizing, 4,000 tons; and tinning, rolling and cutting dpartments.

H. P. Mill (Cleveland, O.)—Wire rods, 5,200 tons; wire, 5,000 tons; nails, spikes and tacks, 130,000 kegs; chains, 150 tons; galvanizing, 1,200 tons.

Findlay (O.) Works—Wire, 3,000 tons; nails, 60,000 kegs.

Salem)O.) Works—Wire, 2,600 tons; nails, 45,000 kegs.

Newburg (O.) Works— Pig iron, 4,000 tons; blooms and billets, 32,000 tons; wire rods, 10,500 tons; beams, angles, etc., 6,500 tons; wire, 7,000 tons; nails, 20,000 kegs; barb wire, 1,£££ tons; staples, 2,000 kegs; galvanizing, 2,400 tons; and tinning, copperas and other mills.

Allegheny (Pa.) Works—Pig iron, 12,000 tons.

Beaver Falls (Pa.) Works—Wire rods, 8,500 tons; wire, 5,500 tons; nails, 75,000 kegs; barb wire, 1,000 tons; staples, 1,000 kegs; galvanizing, 1,700 tons.

Braddock (Pa.) Works—Wire rods, 6,500 tons; wire, 5,000 tons; nails, 45,000 kegs; galvanizing, 2,000 tons.

New Castle (Pa.) Works—Wire rods, 7,000 tons; wire, 6,500 tons; nails, 150,000 kegs.

Rakin (Pa.) Works—Wire rods, 8,500 tons; wire, 8,500 tons; barb wire, 2,500 tons; nails, 75,000 kegs; field fence, 1,250 tons; staples, 3,500 kegs; galvanizing, 4,200 tons.

Shoenberger Works—Pig Iron, 13,500 tons; steel ingots, 15,000 tons; blooms and billets, 10,000 tons; plates, 5,500 tons; sheets, 2,000 tons; horse and mule shoes and calks, 40,000 kegs.

South Side Works, Pittsburg—Wire rods, 8,000 tons; wire, 10,000 tons; nails, 120,000 kegs; staples, 4,000 kegs; field fence, 100 tons; galvanizing, 4,200 tons.

Twenty-sixth Street Works, Pittsburg—Ingots, 17,000 tons; blooms and billets, 16,000 tons.

Allentown (Pa.) Works—Wire rods, 6,000 tons; wire, 6,000 tons; barb wire, 3,300 tons; nails, 45,000 kegs; galvanizing 4,000 tons.

Duncanville (Pa.) Works—Wire rods, 1,800 tons; wire, 1,500 tons; nails, 30,000 kegs.

Newburgh (N. Y.) Works—Wire rods, 2,500 tons; wire, 1,600 tons; barb wire, 700 tons; nails, 12,000 kegs; galvanizing, 700 tons.

San Francisco, Pacific Works—Wire, 1,200 tons; nails, 16,500 kegs; springs, 70 tons; wire rope, 625 tons; staples, 325 kegs.

Central Works, Worcester, Mass.—Wire, 600 tons; tinning department, 300 tons; specialties, 300 tons.

North and South Works, Worcester, Mass.—Steel, 4,000 tons; wire rods, 9,000 tons; wire, 6,500 tons; nails, 13,000 kegs; barb wire, 1,250 tons; bale ties, 13,250 bundles; galvanizing, 2,550 tons: also tinning departments, 850 tons.

The American Mining Co. owns the Negaunee, Mich., mine, the annual output of which is stated at from 175,000 to 200,000 tons of pig iron; the Sauntry mine, which is said to measure 45 to 50 million tons of ore, with estimates running higher; the Alpena mine and the Cuff mine.

The official statement further sets forth that "the plants owned directly, as well as the plants controlled by stock ownership, are free from all encumbrances other than bonded indebtedness of $78,000 on the Allegheny (Pa.) works in our Pittsburg district, said bonds having been issued by the Allegheny Furnace Co., at one time the owners of said works. Mortgage for $22,656.25 on the South Side works, Pittsburg, in our Pittsburg district. This mortgage descended to us from the Oliver Wire Co., and is in favor of Mrs. Rachel C. Pears, and cannot be paid off during her life without her consent. It is intended to pay off this indebtedness at maturity, or before if the holders will accept. Payment has been offered, but has been refused."

Balance Sheet and Stock Investments.

The following is a balance sheet of the company at the close of business, June 30, 1899:

Assets—Plants owned in fee, $75,440,614.73; outside real estate, $6,019.65; stock investments, representing largely ownership of plants and property, $5,348,242.09; cash, $1,435,902.42; bills receivable, $253,189.28; accounts receivable, $7,229,281.04; inventory, raw materials, finished product and goods in process, $7,587,445.64; furniture and fixtures, $55,000; total, $97,355,694.85.

Liabilities: Capital stock—Preferred stock, $40,000,000; common stock, $50,000,000; total, $90,000,000; bonds and mortgages (holders refused payment offered), $130,656.25, ($30,000 of this amount has since been paid); accounts payable (since paid), $3,032,990.15; profit, $4,892,048.45; less dividend No. 1 of $700,000, leaving $4,192,048.45; reserve funds, $59,765; surplus, $4,132,283.45, making $4,192,048.45; total, $97,355,694.85.

The stock investments shown on the balance sheet as aggregating $5,384,242.09 represent cost thereof on the books of the company, and consist of stocks and bonds, which have all been purchased during the last six months and represent important and valuable investments of the company. They are in detail as follows:

Stock investments—American Coke Co. entire capital stock, $25,000; American Supply Co., Ltd., entire capital stock, $10,000; Columbia Wire Co., practically entire capital stock, $41,841.10; Allegheny & S. S. Ry., $500; Salem Iron Co., $9,025; Falls Rivet & Machine Co., $20,273.37; Iron Car Equipment Co., $100; C. Aultman & Co., $2,867.34; Archer & Pancoast bonds, $1,510.25; Continental Wire Co., bonds, $6,000; Shoenberger Steel Co., entire capital stock, $3,600,000; Edgar Zinc Co., 80 per cent of capital stock, $400,000; Standard Supply Co., $6,125; American Mining Co., entire capital stock, $1,000,000; Waukegan & Mississippi Valley R. R., entire capital stock, $60,000; P. & L. E. dock, $100,000; total, $5,2[illegible]3,242.09; stock and mortgage, Hutchins House, Houston, Tex., $65,000; grand total, $5,348,242.09.

A New Southern Iron Company.

A new iron company is to be formed in the South, to be called the Georgia & Alabama Iron Co. It will be capitalized at $1,300,000. It is a consolidation of two important iron and coal properties in the vicinity of Cedartown, Ga. A portion of the lands extend into Alabama. The companies to be consolidated are the Cherokee Iron Co. and the Western Mining Co., with their mineral lands. Of the latter there are about 9,000 acres, with five or six developed ore mines. There is also the Cherokee Furnace at Cedartown. The capital stock will be divided into $650,000 preferred stock and a similar amount of common. The preferred will pay a seven per cent cumulative dividend. The syndicate which will buy the iron properties is composed of Rogers, Brown & Co., and Eugene Zimmerman, of Cincinnati, the vice-president of the Cincinnati, Hamilton & Dayton Railroad, and the owner of the Talladega Furnace property in Alabama. Mr. Zimmerman is also largely interested in coal mining in the South.

In their announcement of appointment as exclusive sales agents for the Tennessee Coal, Iron & Railroad Co., Matthew Addy & Co. give the following list of brands: DeBardeleben, five furnaces, Bessemer, Ala.; Ensley, four furnaces, Ensley, Ala.; Alice, two stacks, Birmingham, run on basic; South Pittsburg, three stacks, South Pittsburg, Tenn.; Eureka, two stacks, at Oxmoor, Ala.; Sheffield, three stacks, Sheffield, Ala. "The irons turned out by these furnaces differ greatly in physical and analytical characteristics and so in practical use they supplement each other. They cover a wide range of foundry and mill requirements."

TOOL STEEL POSSIBILITIES IN CANADA.

Owing to the great demand for iron and steel, and better prices for iron ores, several Ontario iron mines are being developed with encouraging results. Four carloads have recently been shipped from the Belmont iron mine to the Deseronto Furnace, that have been found so satisfactory that further supplies have been ordered, and it is probable that regular shipments from that mine to Deseronto will now be made. The Deseronto Iron Co. make charcoal iron of such high grade that they have just sold 1,000 tons in England, which is now going forward, the furnace requirements for this order being for ore very free from sulphur. Hitherto it has been difficult to find Canadian ores sufficiently pure for such iron. The following analysis has been made by the Deseronto Co. of 71 tons of Belmont ore sent to them, viz.: Metallic iron, 61.29; silica, 6.91; lime, 2.82; phosphorus, 0.003; sulphur, 0.027. Since this shipment to Deseronto development has been steadily going on at the Belmont mine and richer ore has been mined, the following analyses having been made from three different pits considerable distances apart, viz.:

	Metallic Iron.	Silica.	Phosphorus	Sulphur.
No. 1. "Nichol" pit, ...	64.88	5.11	0.003	None
" "	65.80	4.23	0.006	Trace
No. 2. "MacDonnell" pit, . . .	70.02	.92	0.004	"
No. 3. "Blacksmith's Shop," pit,	68.03	3.66	0.006	"

The "Nichol" pit is close to the railway track, the "MacDonnell" pit is about 150 feet to the west, (rather N. W.) and the "Blacksmith's Shop" pit is about 300 feet north of the "Nichol" pit, and there appears to be an almost unbroken body of ore between them, while to the west, north and east the dip-needle shows as heavy an attraction for considerable distances where the ore is not yet uncovered. The above analyses show the Belmont ore to be richer in iron than most of the Swedish ores, while in freedom from impurities it is about equal to the best, and furnishes further evidence that it is suited to make fine tool steel. The Lake Superior iron districts of the United States furnish by far the largest proportion of Bessemer ores, but for Bessemer purposes an ore does not require to be below .05 and very few of the best are below .03, but some analyses of the Belmont ore show only .003 or one-tenth of the amount of phosphorus in the best Bessemer ores.

More than 5,000,000 tons of Spanish ore were used in England for making steel last year, and large quantities on the Continent. The ordinary Spanish ore contains 50 per cent of iron, and .05 phosphorus. Their special ore contains .03 and their extra quality .015 phosphorus, the best being several times more than the Belmont.

Dr. James Douglas, the well known metallurgist of New York, in a recent paper on "Swedish Iron Metallurgy," says: "Although rails are enumerated as one of the many articles into which Swedish crude material is manufactured, comparatively few are made. Swedish steel is too precious to be turned to such vulgar use, and therefore in the very yards of the steel works themselves one generally sees English or Welsh rails." If we have Canadian ores equal to the Swedish, there is no reason we should not make steel equal to theirs, and the present is a most favorable time to start such an enterprise.—[Canadian Manufacturer.

Isaac Joseph Iron Co., of Cincinnati, has opened a branch office in Chicago, under the management of Morris Joseph. The firm has also established an office at Savannah, Ga., with yards giving excellent wharf facilities. Joe Wolf is looking after the company's interests at Savannah. No signs appear of any abatement in the activity in scrap, which is keeping pace with other departments of the market.

A circular has been issued by the Pottstown Iron Co., Pottstown, Pa., to its stockholders embodying a proposition to raise $1,000,000 by subscription to reconstruct the company's steel plant and its Anvil blast furnace. The assent of stockholders must be given by Oct. 1, and the issue of new cumulative preferred stock subscribed for by Feb. 1.

COST OF MOVING FREIGHT ON THE LAKES.

The "Blue Book of American Shipping" has the following on the comparative cost of lake and rail freight per ton mile:

During five years past the cost of moving a ton of frieght one mile on the great lakes, as shown by War Department reports dealing with St. Mary's Falls canal commerce, has been less than a tenth of a cent (a mill), and for ten years past the average has been 1.2 mills. In 1898 it was only seventy-nine hundredths of a mill. A cost of four mills per ton per mile is about the lowest reached on the railways. Comparisons in this regard are made in the following table. Reports of the Lake Shore and Nickel Plate (New York, Chicago & St. Louis) railways have been selected for the reason that costs attending the movment of freight on these Vanderbilt lines are about as low as those of any other lines in the country. It must be understood of course, that the railroad tonnage is largely made up of local freight, while the freight of the lakes is through traffic, and is composed of but few commodities, all of which are handled in large quantities and on long hauls.

Year.	In vessels passing through St. Mary's Falls canals.		On N. Y. C. & St. L. Ry. (Nickel Plate.)		On Lake Shore & Michigan South'n Railway.	
	Tons moved one mile.	Cost per ton per mile.	Tons moved one mile.	Cost per ton per mile.	Tons moved one mile.	Cost per ton per mile.
1889	5,940,646,352	1.5	874,382,713	4.12	1,859,009,822	4.79
1890	7,207,299,415	1.3	1,050,804,339	4.03	2,156,677,869	4.58
1891	7,392,462,269	1.35	1,052,515,236	4.35	2,168,727,231	4.56
1892	9,322,773,938	1.31	1,107,342,842	4.34	2,435,079,712	4.56
1893	8,980,310,240	1.1	946,792,616	4.78	2,427,692,020	4.61
1894	10,927,871,324	.99	896,657,971	4.31	2,196,244,568	4.06
1895*	12,505,548,892	1.14	1,024,736,918	4.09	2,475,757,176	4.10
1896*	13,582,641,886	.99	890,772,263	4.25	2,377,034,418	3.81
1897*	15,969,393,576	.83	904,102,727	4.20	2,473,436,580	3.56
1898*	17,891,597,030	.79	1,046,143,799	4.15	2,771,978,098	3.89
Aver. 10 years.....	10,952,054,492	1.13	979,425,143	4.26	2,334,163,719	4.17

*American and Canadian canals.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Climax Nut Lock Co., of St. Louis, has been incorporated with $50,000 capital stock, by Wilmer Dickerson, James R. Arrendale, Willis E. Leeds and James McElroy.

The Wray-Austin Machinery Co., Detroit, has filed articles of incorporation for the manufacturing of specialties and as manufacturers' agents for steam engine pumps, etc. The capital stock is $16,000, equally divided between Frank T. Caughey, Charles M. Carran, David E. Austin and William J. Wray, all of Detroit.

The Eureka Steel Mfg. Co., of Kokomo, Ind., has been incorporated. Capital stock, $50,000. Directors: W. A. Hyle, Jackson Morrow, T. J. Hanna, M. E. Greeson, W. C. McCune, George W. Kelly, J. O. Greeson. It is announced that a new method of converting iron into steel is to be exploited.

Bids are asked until Sept. 19 for furnishing a quantity of machinery and tools at the Puget Sound, Wash., naval station. A. S. Kenny, Pay-master General, U. S. N., Washington, D. C.

Bids are asked until Oct. 10 for furnishing a quantity of machinery and tools at the Brooklyn Navy Yard. A. S. Kenny, Pay-master General, U. S. N., Washington.

New Construction:—

E. A. Wheeler and W. W. Shilling, of Sharon, Pa., have secured a location in Sharon, and will begin a plant for the manufacture of the Wheeler boiler. It will cost about $50,000.

The Webster, Camp & Lane Machine Co., Akron, O., contemplate an addition to their machine shops, the present plant being overcrowded.

The Eagle Horse Shoe Co., South Milwaukee, Wis., has completed plans for new rolling mill buildings, 50x160 feet, and 40

x96 feet, to contain a new 10-inch rolling train, with a capacity of 60 tons of finished iron per day. A new 300-h. p. Corliss engine, will be put in, two 200-h. p. boilers, a 250-h. p. heater, two heating furnaces, pumps, blowers, shears, cooling beds, dynamos and all necessary equipment for a modern merchant mill. The work will be rushed and it is expected to begin operations in the new plant by Nov. 1. The capacity of the Eagle plant will then be in the neighborhood of 100 tons of bar iron and 300 kegs of horse shoes per day. The company also contemplates later on making other improvements, building three new heating furnaces, and putting in engines of larger power to drive the present 9and 16-inch rolling trains.

The Enterprise Foundry Co., at Muskegon, Mich., will enlarge its plant, increasing capacity about 50 per cent.

The Seamless Construction Co., will erect a machine shop and warehouse, at Hanover and Burnham sts, Milwaukee.

Power Equipment and Machine Tools:—

Westinghouse, Church, Kerr & Co., have just closed a contract with the Iola Portland Cement Co., of Iola, Kan., for 12 Westinghouse gas engines, aggregating 3,000 h. p. Nine of the gas engines will be 300 h. p. each, one 125, one 50 and one 10. The purchasers will use natural gas for fuel, the supply being obtained from a well on the company's premises. Gas engines of 650 h. p. are becoming more numerous. The Westinghouse Machine Co. is placing one of this size in the Carnegie Steel Co.'s works, Pittsburg, and one in the power house of the Columbus Electric Co., Columbus, O.

The Harrisburg (Pa.) Mfg. & Boiler Co. has nearly completed additions to its plant. Orders have just been taken for boilers for St. Joseph's hospital, at Lancaster, and the new plant of the Lewistown Foundry & Machine Works. Other boilers are being constructed for plants at Providence, R. I., and Bridgeport, Conn.

The Minerva Pig Iron Co., operating the Minerva Furnace at Milwaukee, Wis., have made extensive improvements, a new blowing engine, stoves and boilers having been installed.

The Green Engineering Co., of Chicago, have contracted to supply the West Chicago Street Railway Co. with 20 Green traveling grate furnaces for the boilers at the Western Avenue power house. These stokers were adopted by the railway company, after considerable investigation. The conditions in this plant, which is the largest in Chicago, are very severe, as the night and morning load is very heavy. On trial, this furnace showed its ability to realize 700 h. p. from the 400 h. p. boilers. The combustion gas analysis connected with a long series of trials was performed by A. Bement of Bement & Co.

The Stillwell-Bierce & Smith-Vaile Co., Dayton, O., has been busy of late in the construction of air compressors. Through its Chicago office, Jno. T. Shay manager, a large number of sales have been made, including the following: Two 12 and 18x14x18 and one 12 and 18x16x18 cross compound steam duplex compressors for Los Angeles, Cal.; one 12x14x18 straight line compressor for C. B. Booth & Co., Los Angeles, Cal.; one 14x14x20 duplex for the U. S. Milling Co., of Utah; one 12x14x18 duplex for the St. Louis Smelting & Refining Co., of St. Louis; three 16x20 duplex belt compressors for the Manufacturers' Natural Gas Co., of Pittsburg; one 14x14x20 straight line for the Kansas City, Pittsburg & Gulf Railway, of Kansas City; one 14x14x20 straight line for the Creamery Package Co., Kansas City; one 14x14x20 for the Griffin Wheel Co., Chicago; one 12x12x12 straight line for Gas City, Ind.; one 14x12 belt compressor for Barrington, Ill.; and one 16 and 26x16x20 cross compound duplex end compressor for Cheboygan, Mich.

Wilhelm Metzmacher, chief engineer of the Borsig Works of Berlin Tegel, the largest locomotive shops in Germany, is in this country purchasing equipment for an extension of the company's machine shops. Mr. Metzmacher was in Pittsburg last week.

Somers, Fitler & Clarke, of Pittsburg, agents for the sale of the Otto gas engines, have lately made sales of a 20 h. p. engine to Kress Bros., Allegheny; 56 h. p. engine to the Canonsburg Iron & Steel Co., Canonsburg, Pa; two 20 h. p. engines to the Auto-Car Co., Pittsburg; one 27 h. p. engine to Zug & Co., Pittsburg, and one 20 h. p. engine to Heyl & Patterson, Pittsburg.

The Sebastian Lathe Co. turned out and sent abroad in August 110 lathes of various sizes. Export business in this particular tool for iron working is reported at present better than domestic.

Among the foreign contracts lately taken by the Laidlaw-Dunn-Gordon Co., are one for 42 steam pumps for Copenhagen, Denmark; another for 28 pumps for Shanghai, China; and one of special note is from England for three large hydraulic pumps for tobacco works.

Fires and Accidents:—

The Globe Metal Works, at Fullerton near Allentown, Pa., were destroyed by fire Aug 23, with considerable equipment and stock. Loss, $6,000, partly insured.

At the Edward P. Allis Co.'s foundry, Milwaukee, Aug. 28, five men were injured by the falling of a 27-ton casting which was being hoisted.

Lightning disabled the electric crane and destroyed a number of molds in the steel casting plant of the Lorain Steel Co., Johnstown, Pa., and the plant was shut down last week.

The explosion of a boiler at the Republic Iron Works, Pittsburg, Sept. 1, caused the death of five employes and partly wrecked the mill. The plant was closed down.

At Albany, Ind., Aug. 26, the hot mill of the Albany Mfg. Co.'s tube plant was burned. The loss is $40,000, over $25,000 worth of tubing being destroyed.

At Lockport, N. Y., the brass and iron bedstead factory of Oliver Bros. was destroyed by fire Aug. 28. The loss is estimated at $250,000, with $140,000 insurance.

The Pittsburg District:—

Work has been commenced on the superstructure of the cold rolled steel shafting plant being built by William Fitch, at Rankin, Pa., and the plant is expected to be in operation by the end of October.

Maj. Edward Gerouard, of the Royal Engineers of the British army, is in Pittsburg, making contracts with the Pressed Steel Car Co. for 400 steel gondola cars for the Egyptian States Railroad.

Members of the Tenth Regiment of Pennsylvania, who returned to Pittsburg last week, state that while in San Francisco, H. M. Scott, president of the Union Iron Works, said that the concern proposed building an armor plate plant shortly, to contain eight open-hearth furnaces and possibly some Bessemer converters, to produce other material, the intention being to use Cuban iron ore, which would be well suited for the purpose and could be laid down in San Francisco at a moderate cost for freight. Certain members of the regiment, who have positions in Pittsburg steel works, state that they were offered positions in the proposed steel works. The statements cannot be confirmed.

The Pennsylvania Coal Co., Pittsburg, was granted a charter last week with an authorized capital stock of $1,000. The board of directors named in the charter comprises William I. Mustin, George W. Henderson and Harvey E. Gardner, of Pittsburg.

Part of the new plant of the Pressed Steel Car Co. at McKees Rocks, Pa., is being started in operation this week, and it is expected that the whole plant will be in operation by October 1.

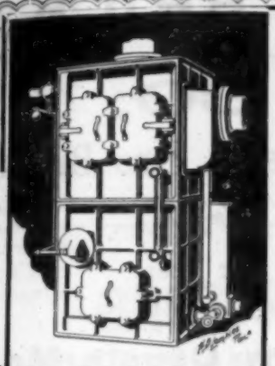
The Pressed Steel Car Co., Pittsburg, refuses to deny or confirm the report that it contemplates erecting a plant in England to supply a part at least of the foreign demand for pressed steel freight cars.

Hyde Bros. & Co., Pittsburg, are putting in a 500 h. p. water tube boiler at the Detroit plant of the American Car & Foundry Co.

Chicago District and Northwest:—

The Chicago Heights (Ill.) Boiler Works have closed a contract with the Chicago Heights Land Association for a site and will at once erect a building 60x125 feet, with truss roof. The new works will have direct connection with the Michigan Central Railroad, the Elgin, Joliet & Eastern Railway, the Chicago & Eastern Illinois Railroad, the Chicago Terminal Transfer Railroad, and the Chicago Heights Belt Railway. The company selected Chicago Heights on account of the superior railway and shipping facilities furnished by the three belt lines and several trunk lines.

The Hicks Car Works, Chicago, have awarded a contract



Really Didn't Need New Boilers.

One of our representatives, some three or four months ago, called at a plant where they were about to buy two new boilers—tried to sell them a heater, but they "had one—didn't need another," though they were greatly troubled with scale. Finally, we got the opportunity of investigating the plant—600 h. p. of boilers. 300 h. p. of the steam they made was passed through a closed heater, but because of scale and insufficency of heating surface, the feed supply was delivered at a temperature of only 140°. Putting in a ***Cochrane Heater,*** *and making some changes in the piping, will mean to the owners of that plant a saving of close to twenty (20%) per cent of their total fuel bill, or a net saving each year (they run 24 hours a day, seven days each week) of about $2,500.00, or, with coal consumption as at present, they can take 20% more work from the old boilers. The new boilers will probably not be needed.*

This illustrates what can be done by properly utilizing exhaust steam. The foundation of an economical plant is a COCHRANE HEATER. They are conceded by many of the largest steam users to be the most practical, common sense appliance for the purpose now on the market.

HARRISON SAFETY BOILER WORKS,

Clearfield & 17th Sts. Philadelphia, Pa.

for the erection of an addition to their works, which will be 60x200 feet, and which will be an extension of the present buildings.

The Titan Steel Co., which was repoted to have taken seven acres of ground at Pullman, from which 14 dwellings were removed last year, has taken no steps to build the proposed plant for the production of Mannesman tubing. The company was incorporated with $500,000 capital.

The Chicago Pneumatic Tool Co. notes as an indication of the growing favor with which pneumatic tools are received by railroads, shipyards, boiler manufacturers and others that the sales of its tools in August were equal in volume to the total sales for the year 1897. Nearly all branches of metal working now employ some pneumatic appliances, and plants which started with a small outfit have largely increased the number of tools in use. The manufacturers of pneumatic tools point to the increase in trade, month by month, as an indication that pneumatic tools have passed the experimental stage and are generally recognized as labor savers. In every railroad shop in the country pneumatic tools are found in successful operation and constant additions are being made to such equipment. Among recent advances in American labor saving appliances the development in respect to pneumatic tools is to be regarded as one of the most important.

The Arcade Mfg. Co., manufacturer of hardware specialties, Freeport, Ill., is now building a large addition to its factory, consisting in part of a substantial brick building 50x100 feet which will be devoted exclusively to wood work machinery. The company will equip it with the latest improved machinery for wood work. This addition will largely increase present facilities and permit of turning out fully double the goods that have been produced heretofore. The latest specialty the company has put on the market is its Crystal coffee mill.

Among the rolling mill engine orders taken recently by the Edward P. Allis Co., of Milwaukee, is a reversing mill engine for the American Steel & Wire Co., at its Worcester, Mass., plant. This machine has two steam cylinders, 40-inch diameter by 60-inch stroke. The feature of this machine is placing one of the cylinders in a vertical position immediately over and supported on the same bed plate to which the second cylinder is attached, which is placed in a horizontal position, both cylinders being connected to the same crank pin, which is 22 inches in diameter; by this means securing a quarter crank machine and using but one crank pin. The company has taken an order also for one tandem compound condensing finishing mill engine from the Pennsylvania Steel Co., at Steelton, Pa.

After a shut down of a week for lack of pig iron, the converter mill of the Federal Steel Co., at Joliet, started up last week. The rod mill, closed on account of an engine breakdown, also started.

The Vilter Mfg. Co., of Milwaukee, notes a particularly active business in Corliss engines. It sold a goodly number in August, mostly large sizes. Some of these are intended to increase the capacity of plants; others are intended for the establishment of new plants. The company is still operating its works day and night and will have to continue to do so for some time to come.

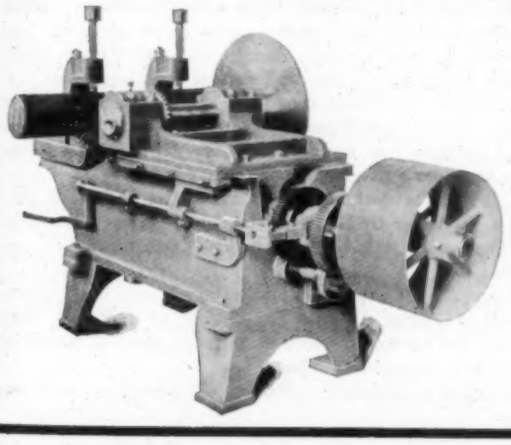
General Industrial Notes:—

The new portion of the Syracuse Tube Works plant, Syracuse, N. Y., has been set in motion.

The National Vapor Stove Co., Lorain, O., has bought the stove interests of the Dayton (O.) Mfg. Co., and will remove the factory to Lorain. About 75 cars of equipment will be moved.

It is reported that a purchase has been made from ex-President Reinhart, of Topeka, Atchison & Santa Fe, of the mining properties of the Augusta Mining & Investment Co., in Virginia, Georgia and Alabama. A company will be organized with a capital of $1,000,000 to operate the mines and establish a furnace in Georgia and another in Alabama.

Jefferson Furnace, at Oak Hill, Jackson county, O., idle since March, 1897, will start up again. The stack was built



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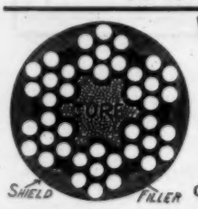

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in 1854 and was operated steadily for 43 years. Its product is charcoal iron. The original stock, which was $50,000 was subscribed for wholly by Welshmen, and the constitution of the company prohibited all but those of Welsh birth from holding stock. In the 43 years it was operated it paid in dividends 195 per cent.

What is undoubtedly a world's record in rolling merchant bar was recently made upon the combination mill, of the Aetna-Standard Iron & Steel Co., at Mingo Junction, O., designed and built by Morgan Construction Co., of Worcester, Mass. The output in eight hours was 261,045 pounds; in 12 hours, 388,120 pounds; in 24 hours, 725,665 pounds. The week's output was 3,623,915 pounds.

The Brass Founders' Supply Co., of No. 20 Prospect st., Newark, N. J., reports that it is selling five times as many improved ribbed flasks as at this time last year. There is also a large increase in foundry supply sales, and the company recently shipped across the continent the entire foundry equipment for both brass and iron foundries of the new Puget Sound Naval Station, at Bremerton, Wash. The improved ribbed flasks were specified in this connection. The Brooklyn Navy Yard recently put in a large number of these flasks after having them tested on the Tabor molding machine which is operated with compressed air. Other yards also have these flasks in use, and most of the large electrical companies and large brass foundries have adopted them as standard. The Brass Founders' Supply Co., in view of expanding business, has found it necessary to add new machinery and floor space from time to time in the year.

The plant of the Aschman Steel Casting Co., at Sharon, Pa., has been purchased by National Malleable Casting Co. interests. The works will be used in the manufacture of car knuckles.

At Pottsville, Pa., the Schuylkill Haven Iron Works have been sold to Colonel Thomas H. Rickert, of Pottsville, who represents the syndicate which has already secured control of mills at Danville and Columbia, Pa.

The Baldwin Locomotive Works, Philadelphia, have re-

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ceived an order to supply 20 compound locomotives for Saxon state railways. The price is 54,760 marks for each engine. A Saxon firm made a slightly lower tender, but required a much longer time for delivery.

The Continental Iron Co., operating rolling mills at Wheatland, Pa., and Niles, and Girard, O., has leased the muck bar mill at Sharon, Pa., from the Setwart Iron Co., and will have it in operation in two weeks.

An exceptional record was made on Aug. 21 by the single heating furnace at the Ashland Iron & Steel Co.'s plant, Ashland, Ky. In 10½ hours the four-inch billets taken from the furnace produced 120 tons of wire rods. The furnace was designed by the Garrett-Cromwell Engineering Co., New England Bldg., Cleveland.

Pioneer Furnace of the Cleveland-Cliffs Iron Co., at Gladstone, Mich., has been out for relining the past month, after a campaign of over three years. It will blow in in about two weeks.

At the two Hellertown, Pa., furnaces of the Thomas Iron Co., arrangements are being made for the installation of the pig iron casting apparatus, the make of Heyl & Patterson, Pittsburg.

The West Penn Foundry & Machine Co., Avonmore, Pa., has closed a contract with the LaBelle Iron Works, Wheeling, W. Va., for the construction of a 24-inch three high bar mill at Steubenville, O.

Ohio State Fair Excursions via Pennsylvania Lines.

Sept. 4 to 8, inclusive, low rate non-transferable excursion tickets will be sold to Columbus from Pennsylvania Lines ticket stations in Ohio for the State Fair; return coupons good until Saturday, Sept. 9.

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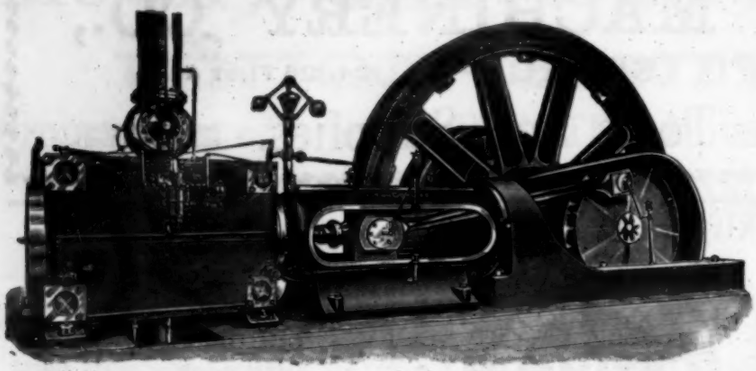

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge been issued in this or any other country."

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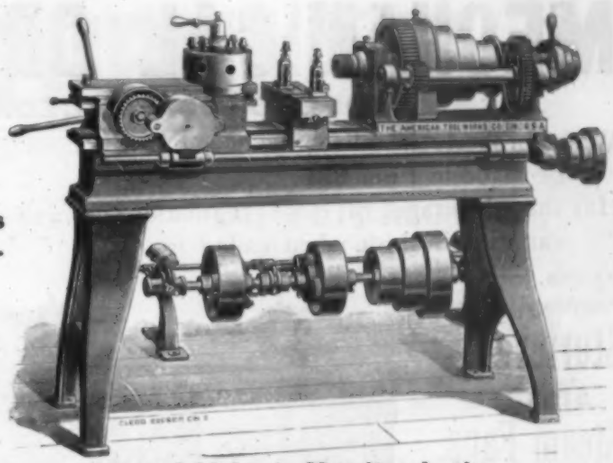

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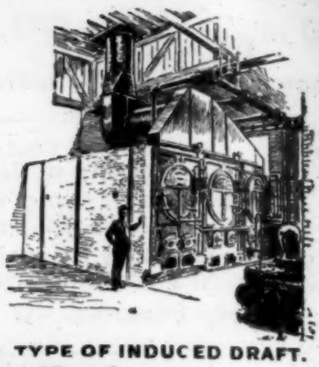

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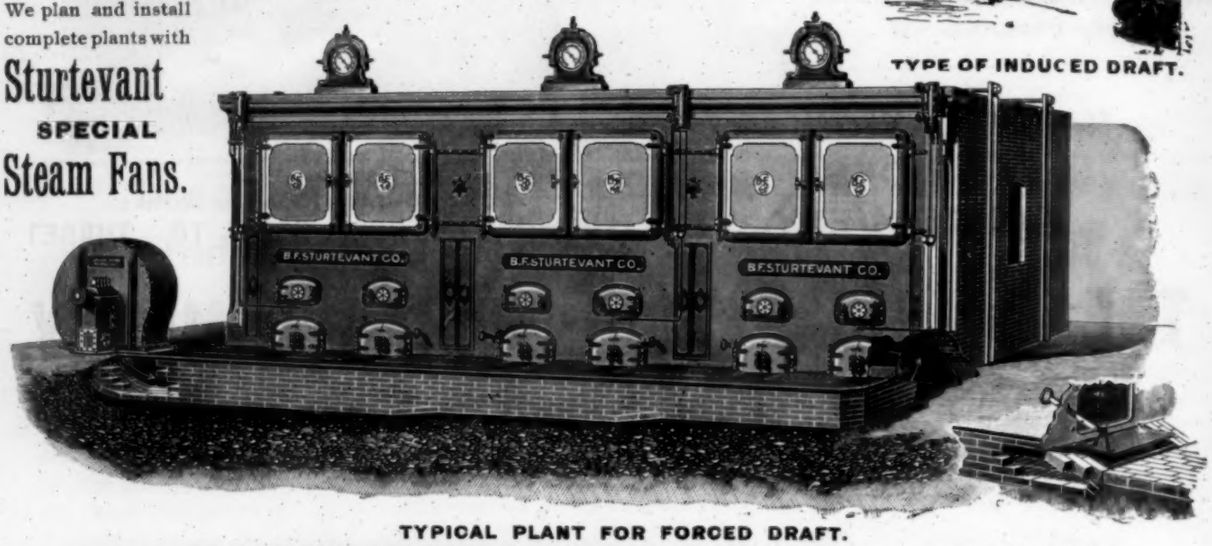

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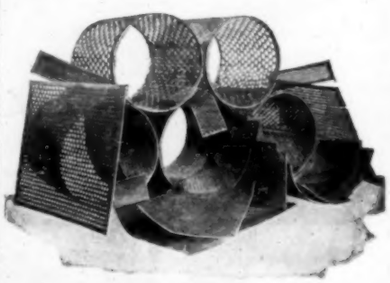

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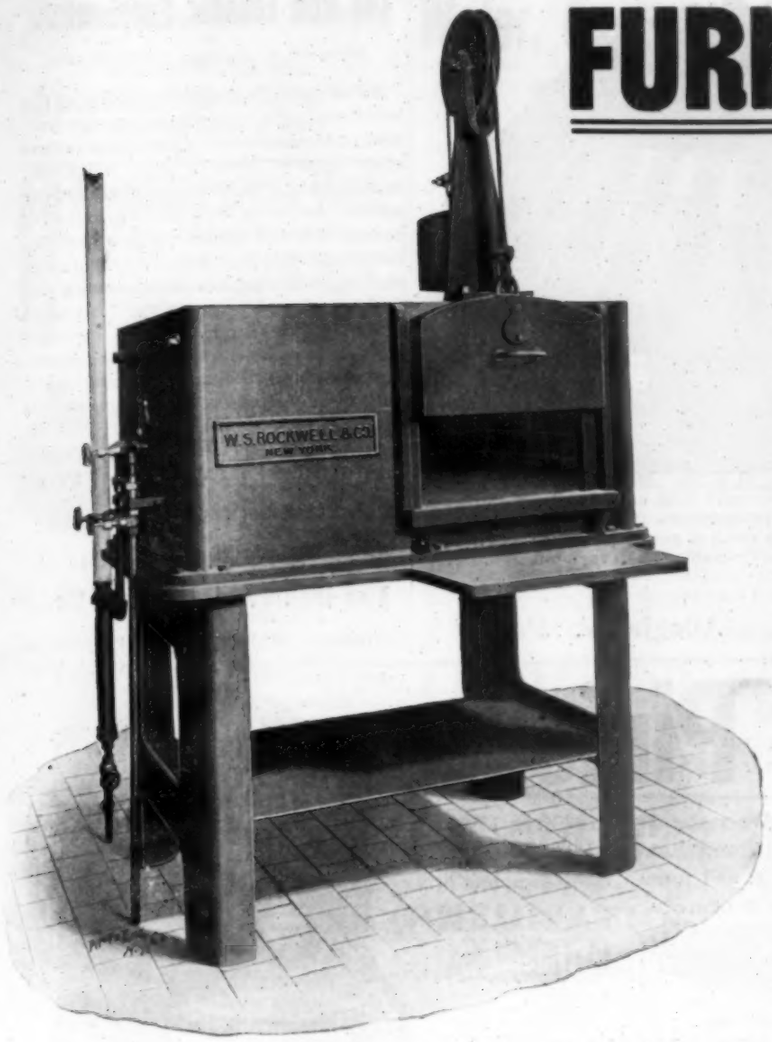

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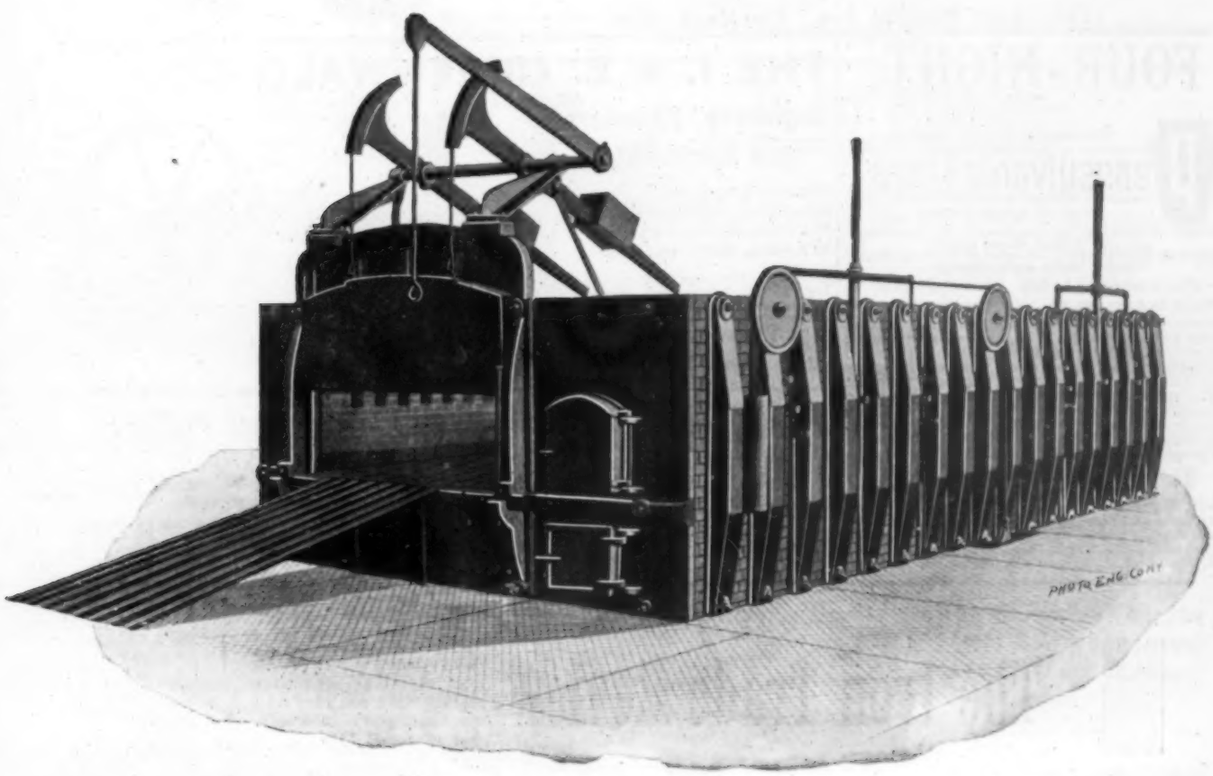

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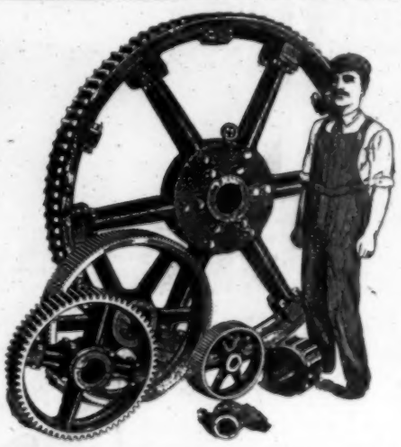

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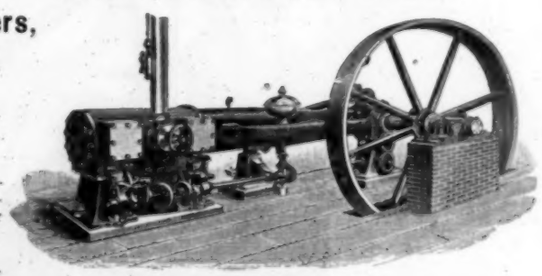

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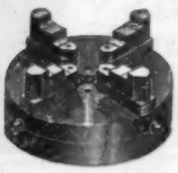

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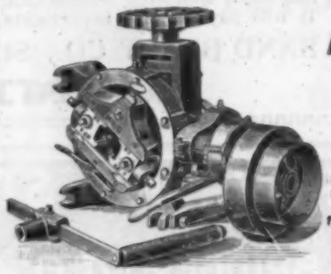

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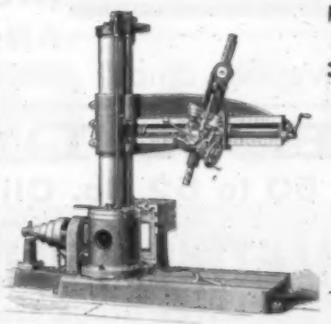

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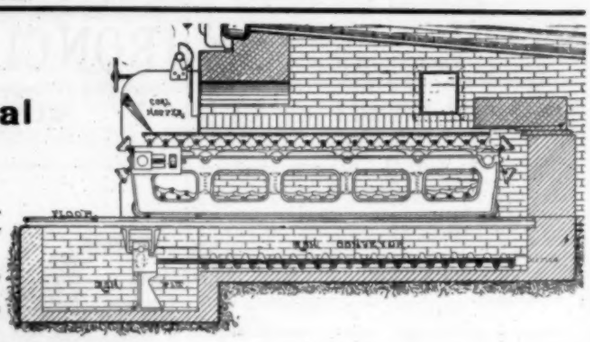

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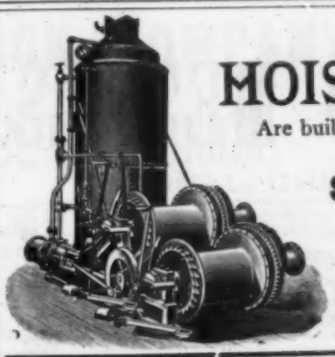

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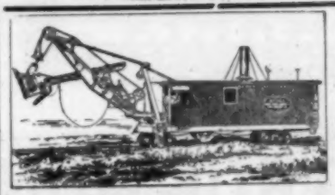

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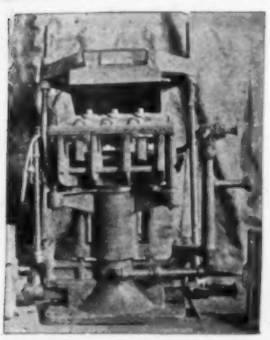

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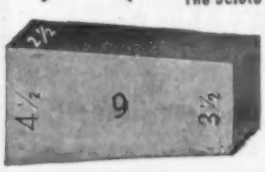

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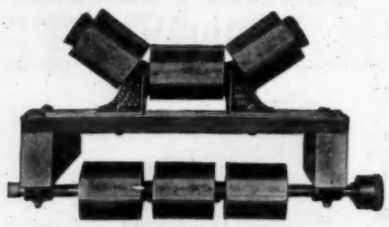

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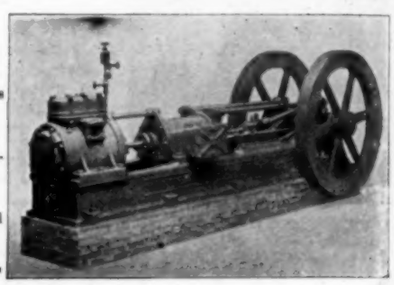

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To the Iron and Steel Works of the United States for 1898.

PUBLISHED BY
THE AMERICAN IRON AND STEEL ASSOCIATION.

Thoroughly Revised. Price, Seven Dollars.

The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which are large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

In the edition for 1896 there was given for the first time a complete list of Malleable Iron Works in the United States, and to this new feature there are now added complete lists of the Rail Mills, Structural Mills, Steel Casting Works, Bolt, Nut and Rivet Works, Chain Works, Seamless Tube Works, and Riveted Pipe Works—all new features.

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition. It contains a complete list of all the

Blast Furnaces,
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Bessemer Steel Works,
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Chain Works,
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Car Builders in the United States

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

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Time Table effective May 15th, 1898.

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15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester	8:25	10:50	6:40
3	3	1	Main Line	2	4	6
5:30	2:25	7:20	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester	7:29	10:49	6:19
6:52	3:35	8:30	Medina	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport	.....	6:05	1:40
.....	8:25	.....	Bellaire	.....	5:50	.....
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p.m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

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SECOND EDITION

OF

Chemical and Metallurgical

HANDBOOK

CONTAINING

Tables, Formulas and Information for the use of Chemists, Metallurgists and Mining Engineers.....

BY

J. H. CREMER, M. E.,

AND

G. A. BICKNELL, M. S.

EXTRACT FROM PREFACE:

In the preparation of the second edition of our Handbook, the general plan of the first edition has been followed, viz., to present in concise form such data and information as are useful to the chemist and metallurgist. Several tables of the first edition, which were of somewhat limited use, have been omitted, while more than one hundred pages of new matter have been added.

The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

The hygrometric table gives the necessary information for determining the amount of moisture in air, a subject whose importance in metallurgical operations is being more fully recognized at present than heretofore. This table is new and is based on the most accurate data available at the present time.

The tables of weights and measures, United States and foreign, have been very much amplified, and the conversion tables for United States and metric weight and measures of the U. S. Coast and Geodetic Survey included, the latter being based on the legal standard for this country.

Numerous miscellaneous tables have been added, which, it is hoped, will be found of value

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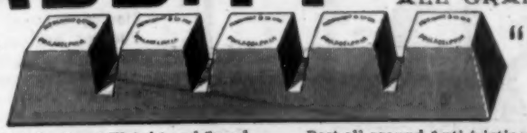

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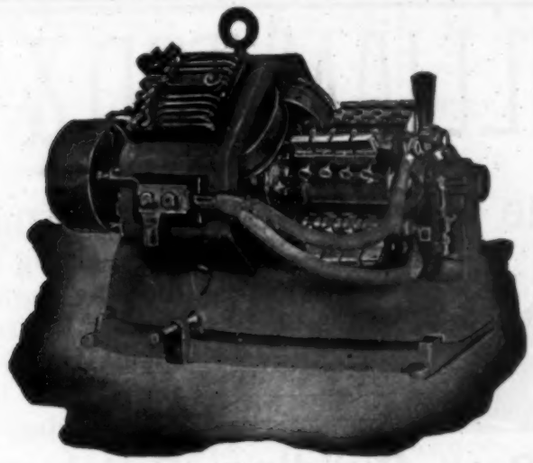

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Old iron rails	$23 00
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1 to 1⅞	2.25 Base.
2 to 2¾	.30 extra.
3 to 3½	.50 "
3¾ to 4	.80 "
4¼ to 4½	1.00 "
4¾ to 5	1.30 "
5¼ to 6	1.80 "
6¼ to 6½	2.20 "
6¾ to 7⅛	2.50 "
¾ to ⅞	.10 "
9-16 to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 13-32	.40 "
⅜ to 13-32	.50 "
5-16 to 1-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅜ to 1	1.05 Base
4¼ o 6 x ⅜ to 1	.10 extra
6¼ o 8 x ⅜ to 1	.60 "
8¼ o 10 x ⅜ to 1	.80 "
1¼ o 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1¼ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¾ to 15-16 x ⅜ to ⅞	.40 "
⅝ to 11-16 x ⅜ to ⅞	.50 "
¼ to 9-16 x ⅜ to ⅞	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	.30 "
¼ to 13-16 x ¼ to 5-16	.50 "
⅜ to 11-16 x ¼ to 5-16	.80 "
¼ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of **Heavy Bands.**

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7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "

7-16 to ½ x No. 9 to 3-16.....1.30 extra
7-16 to ½ x Nos. 10, 11 and 12.....1.40
⅝ x No. 9 to 3-16.....1.50
⅝ x Nos. 10, 11 and 12.....1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.....
Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½.....40 extra
½ to 13-16.....50 "
⅝ to 11-16.....60 "
¾ to 9-16.....80 "
⅞ to 7-16.....1.10 "
1 to 9-16 x 3-16.....1.00 "
1 to 11-16 x ⅛.....1.20 "

Half Oval and Half Round.

2¼ to 3.....60 extra
2 to 2.....50 "
1¾ to 13-16.....70 "
1½ to 11-16.....90 "
1¼ to 9-16.....1.20 "
1⅛ to 7-16.....2.50 "
5-16.....3.50 "
¼.....4.50 "

Half Ovals less than ¼ their width in thickness extra price.

Horse Shoe Iron.

All sizes.....1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base.
		Extras.
1¼ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs
1 to 1¾,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¾,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.	
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras.
7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs
7-16 to 2,	" 20	.10 "
7-16 to 2,	" 21	.15 "
7-16 to 1¼,	" 22	.25 "
½ to 1¼,	" 13, 14 and 15	.05 "
½ to 1¼,	" 16, 17 and 18	.10 "
1¼ to 1¾,	" 19 and 20	per 100 lbs.
1¼ to 1¾,	" 21	.20 "
1¼ to 1¾,	" 22	.30 "
15-16 and 1,	" 13, 14 and 15	
15-16 and 1,	" 16, 17 and 18	.15 "
15-16 and 1,	" 19 and 20	.20 "
15-16 and 1,	" 21	.25 "
15-16 and 1,	" 22	.35 "
⅞,	Nos. 13, 14 and 15	.20 "
⅞,	" 16, 17 and 18	.25 "
⅞,	" 19 and 20	.30 "
⅞,	" 21	.35 "
⅞,	" 22	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	" 16, 17 and 18	.35 "
¾ and 13-16	" 19 and 20	.40 "
¾ and 13-16	" 21	.45 "
¾ and 13-16	" 22	.50 "
¾ and 13-16	" 23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	" 16, 17 and 18	.40 "
11-16,	" 19 and 20	.50 "
11-16,	" 21	.60 "
11-16,	" 22	.70 "
11-16,	" 23	.80 "
⅝,	Nos. 13, 14 and 15	.40 "
⅝,	" 16, 17 and 18	.45 "
⅝,	" 19 and 20	.55 "
⅝,	" 21	.65 "
⅝,	" 22	.75 "
⅝,	" 23	.85 "
9-16,	" 13, 14 and 15	.45 "
9-16,	" 16, 17 and 18	.50 "
9-16,	" 19 and 20	.60 "
9-16,	" 21	.70 "
9-16,	" 22	.80 "
9-16,	" 23	.90 "
½,	" 13, 14 and 15	.55 "
½,	" 16, 17 and 18	.60 "
½,	" 19 and 20	.70 "
½,	" 21	.80 "
½,	" 22	.90 "
½,	" 23	1.00 "
7-16,	" 13, 14 and 15	.80 "
7-16,	" 16, 17 and 18	.90 "
7-16,	" 19 and 20	1.00 "
⅜,	" 13, 14 and 15	1.00 "
⅜,	" 16, 17 and 18	1.10 "
⅜,	" 19 and 20	1.20 "

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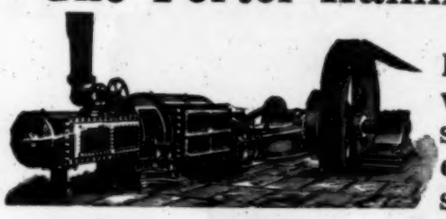

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Republic Iron & Steel Co., Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelshia, Pa.
Swarts Metal Refining Co., Chicago, Ills.
F. R. Phillips' Sons Co., Philadelphia, Pa.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, NewYrok City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis,
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co , New York City.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
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Baush & Harris Machine Tool Co., Springfield, Mass.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

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OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
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James Bonar & Co., Pittsburg, Pa.

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
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Austin Separator Co., Detroit, Mich.

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The Pressed Steel Car Co., Pittsburg, Pa.

ORE CRUSHERS—
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Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

ORE SCREENS—
Seibel-Suesdorf Copper & Iron Mfg Co., St. Louis, Mo.
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

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Jenkins Bros., New York City.
PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
The Shearer-Peters Paint Co., Cincinnati, O.
PATTERN WORKS—
Gobeille Pattern Co. Cleveland O
PERFORATED METALS—
Seibel-Suessdorf Copper & Iron Mfg. Co., St. Louis, Mo.
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
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Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
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Danielson Machine & Tool Co., Cleveland, O
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Republic Iron & Steel Co., Chcago, Ill.
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Danielson Machine & Tool Co., Cleveland, O.
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Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
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National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.
S. Fix' Sons, Cleveland, O.
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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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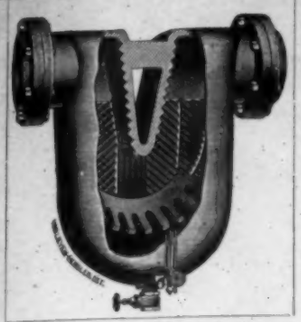

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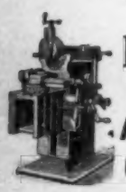

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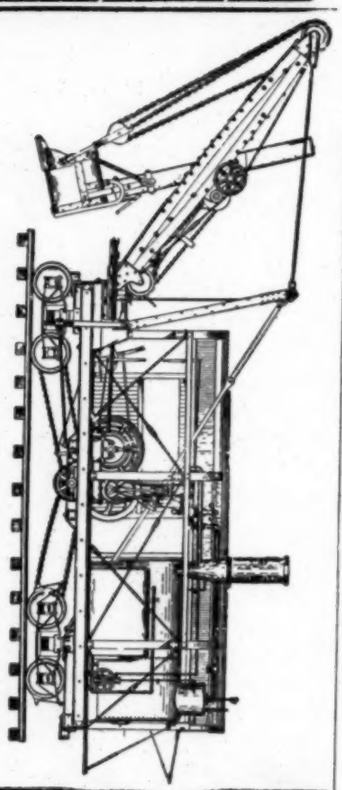

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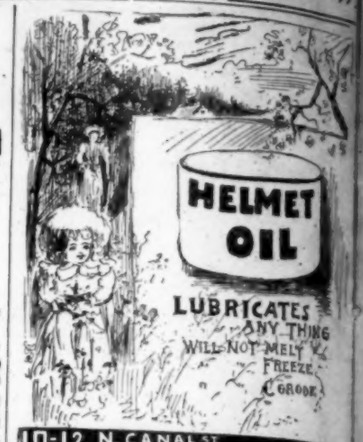

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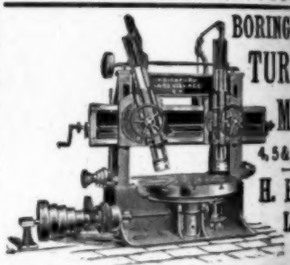

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